

**book**

**2**

# ***CANADIAN BUSINESS MATHEMATICS***

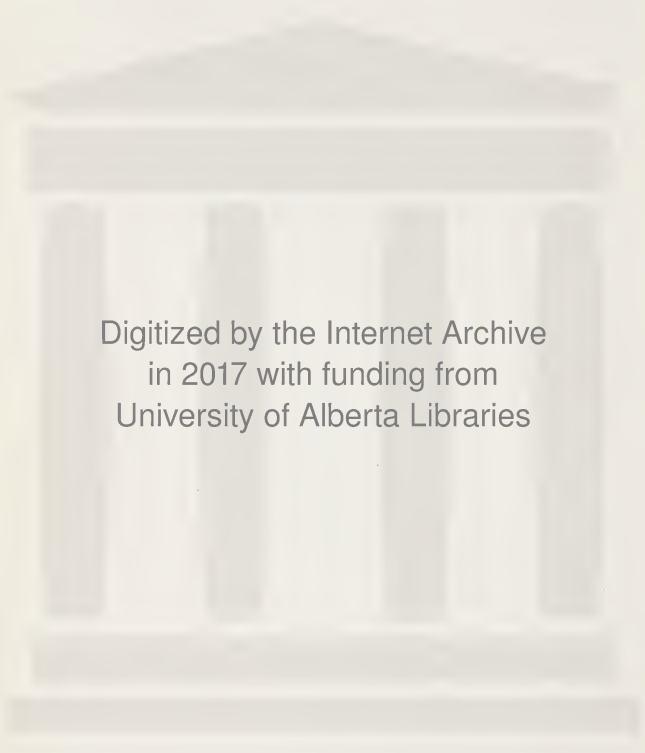
***CATHERINE  
LUND***

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*CANADIAN  
BUSINESS  
MATHEMATICS*

**book 2**

**CATHERINE LUND**

**B. A., M. COM., C. G. A.**

GREGG DIVISION  
McGRAW-HILL COMPANY OF CANADA LIMITED  
New York                      TORONTO                      London

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## P R E F A C E

Mathematics is a universal language that we all use in our everyday living. In business it is indispensable, and a thorough groundwork is necessary in order to use it as a tool in the business world.

*Canadian Business Mathematics, Book 2*, endeavours to provide an insight into the uses of mathematics in the various phases of business as practised in Canada, including investing, buying and selling on credit, purchasing and selling of real estate, and insurance. In addition to covering the mathematics involved in solving basic business problems, the book also gives the student a working knowledge of many phases of Canadian business.

After each new concept is introduced, an abundance of problem material is provided to aid the student in mastering each section. Each chapter is self-contained; hence they may be used in any desired order, and single chapters may be utilized as required.

While this book is based on the elementary business mathematics presented in *Canadian Business Mathematics, Book 1*, it can be used following any introductory textbook, and can be understood by anyone with a working knowledge of arithmetic.

CATHERINE LUND

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# C O N T E N T S

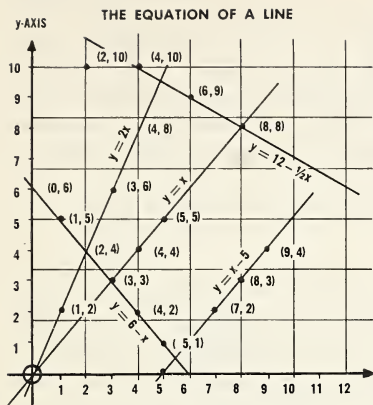
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# Business Algebra 1

## A Business Problem

Pavel & Adrian Products manufacture Telstars for Toddlers. However, their machinery is worn out, and this month the repair bill amounted to \$5,000. The fuel, heat and light bill amounted to \$2,000; wages paid to workmen amounted to \$2,400. The revenue from the sale of Telstars amounted to \$14,570; all other expenses, \$2,375.

Upmanship Enterprises have offered to rent them a new efficient machine for \$6,500 a month. If this machine is installed, it is estimated the following changes will occur: increase in work manufactured and sold, 45%; increase in fuel, heat and light bills, 18%; increase in payroll costs, 15%; decrease in repair bills, 100%.

Let  $x$  = the difference in costs of the two alternatives; form an equation and solve for  $x$ .

Also, by means of a comparative statement of profit and loss, discuss the new proposition with a view to advising Pavel & Adrian Products as to their best course of action.

Algebra is the shorthand of mathematics. It enables persons in all types of occupations to solve their particular problems, and to interpret formulas and tables. Its use of symbols makes it possible to express complicated relationships in a simple and compact form.

## SECTION 1 Symbols, Equations and Axioms

### Symbols

The arithmetic symbols used in algebra are:

$$+ \quad - \quad \times \quad \div \quad =$$

The symbol  $.$  is often used instead of the arithmetic  $\times$  for multiplication, and sometimes the multiplication symbol is entirely omitted; e.g.,  $ab$  stands for  $a \times b$ .

Letters of the alphabet represent numbers, relationships and concepts. Usually small (lower case) letters, such as a, b, c, x, y, z, are used to represent numbers; frequently the first letters of the alphabet represent known numbers and the final letters unknown numbers. Capital (upper case) letters are used most often to express relationships or concepts.

## Equations

### *In one unknown:*

An equation denotes that two quantities or expressions are equal in value. Hence the two quantities are connected by the equal sign. Equations are frequently used to solve mathematical problems involving an unknown number, which is represented by a symbol such as "x". An equation in one unknown is said to be solved when the numerical value of the unknown, x, is found. The solution involves manipulating the terms to equate the known to the unknown. That is, all the terms of x are arranged on the left side of the equation and all the others on the right; then the terms on each side are combined and reduced to x, and thus the numerical value of x is ascertained. (See Section 2 for the definition of "term.")

*Example:* John is three times as old as Jackie. The sum of their ages is 16. Find the ages of John and Jackie.

---

Let  $x$  = age of Jackie; then  $3x$  = age of John.

$$\therefore 3x + x = 16$$

$$\therefore 4x = 16$$

Proof:

$$\therefore x = 4$$

$$4 + 12 = 16$$

$\therefore$  Jackie is 4 years old, and John is 12 years old.

### *In two unknowns:*

It is not always possible to reduce the unknown, x, to a numerical value; x may be expressed in terms of a second unknown, such as "y". If this is the case, x will depend for its value on y; in other words, x will *vary* as different values are assigned to y.

*Example:* Sylvia is one year more than twice as old as Sam. Find the ages of Sylvia and Sam.

---

Let  $x$  = Sylvia's age

Let  $y$  = Sam's age

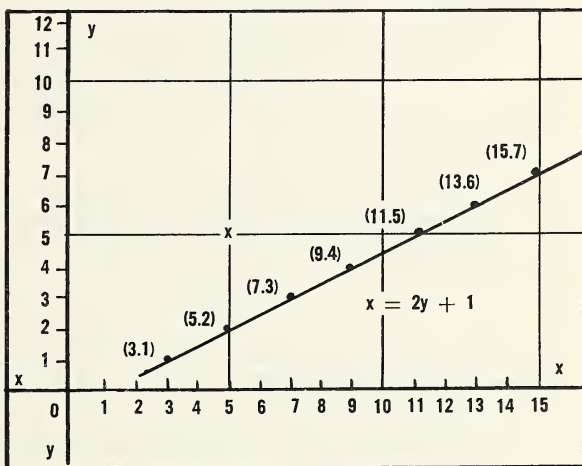
Then  $x = 2y + 1$

A table can be drawn up assigning values to  $y$  and solving for  $x$ :

$x$	3	5	7	9	11	13	15
$y$	1	2	3	4	5	6	7

These values can now be plotted on a graph. See figure 1-1.  
(Also see p. 152 of CANADIAN BUSINESS MATHEMATICS, Book 1.)

Figure 1-1



## Axioms

Axioms are self-evident truths. The following axioms of algebra are used to solve equations:

1. The equality of two sides of an equation will be maintained if the same number is added to both sides. For example, if  $x = y$ , then  $a + x = a + y$ .
2. The equality of two sides of an equation will be maintained if the same number is subtracted from both sides. For example, if  $a = c$ , then  $a - b = c - b$ .
3. The equality of two sides of an equation will be maintained if both sides are multiplied by the same number. For example, if  $s = t$ , then  $sx = tx$ .
4. The equality of two sides of an equation will be maintained if both sides are divided by the same number. For example, if  $m = n$ , then  $m \div y = n \div y$ .

5. If two different symbols are both equal to the same symbol, they are equal to each other. For example, if  $x = y$  and  $y = z$ , then  $x = z$ .

Example: (a) Solve:  $x - 5 = 9$

Use Axiom 1. Add 5 to both sides:

$$\begin{aligned}x - 5 + 5 &= 9 + 5 \\x &= 14\end{aligned}$$

(b) Solve:  $x + \$1.98 = \$2.49$

Use Axiom 2. Subtract \$1.98 from both sides:

$$\begin{aligned}x + \$1.98 - \$1.98 &= \$2.49 - \$1.98 \\x &= \$0.51\end{aligned}$$

(c) Solve:  $\frac{2}{3}x - 2 = 18$

Use Axioms 1 and 3. Add 2 to each side; then multiply both sides by  $\frac{3}{2}$ :

$$\begin{aligned}\frac{2}{3}x - 2 + 2 &= 18 + 2 \\ \frac{2}{3}x \times \frac{3}{2} &= 20 \times \frac{3}{2} \\ x &= 30\end{aligned}$$

(d) Solve:  $9 + 4x = 25$

Use Axioms 2 and 4. Subtract 9 from each side; then divide each side by 4:

$$\begin{aligned}9 + 4x - 9 &= 25 - 9 \\ \frac{4}{4}x &= \frac{16}{4} \\ x &= 4\end{aligned}$$

## WORKOUT EXERCISE I

1. Why do you consider algebra an important branch of mathematics?
2. What use is made of symbols in algebra?
3. To what use are the upper and lower case letters of the alphabet put? Give three examples of the use of each.
4. What are the four axioms relating to the equality of an equation? Give an example of each, other than that given in the text.
5. State the axiom describing what follows when two different symbols are related to the same symbol, and give three examples.

In each of the following problems let  $x$  = the unknown number, state the equation, solve the equation, state the answer, and verify:

6. Ten less than seven times a certain number is 11.
7. I am thinking of a number. If I treble the number and add 4, the result is 10. Find the number.
8. Gertrude has spent \$1.70 less than four times the amount Albert has saved. Gertrude has spent 30¢. How much has Albert saved?
9. What number decreased by 15 is 22?
10. A number increased by  $\frac{1}{8}$  that number is 72. What is the number?
11. Paul and Peter have 288 marbles between them. If Paul has twice as many marbles as Peter, how many marbles has each one?
12. Sally needed \$50 to buy a new coat. Her father promised that if she doubled her savings he would give her the last \$7.50. How much had she saved?
13. Abigail bought a lipstick, an eyebrow pencil and a bottle of nail polish. She paid three times as much for the nail polish as for the eyebrow pencil and 9 cents more than  $\frac{2}{3}$  as much for the lipstick as for the nail polish. If she spent \$1.59 for the three items, how much did each cost?

In each of the following examples form an equation in two unknowns and on graph paper draw a graph to represent the equation. Label all the co-ordinates (points plotted) giving the  $x$  value first.

14. Grace has 2 pennies less than 3 times as many pennies as Lynn.
15. Abraham has 8 more books than Mark.
16. Saul has 2 less marks than half the marks of Lorrie.
17. Chris has four bicycles minus twice the number owned by Rollo.
18. Charlie has one quarter as many toys as Adolph.
19. John has 4 less than 3 times as many marbles as Gladys.

Plot the graphs of the following equations on graph paper labelling all the co-ordinates:

20.  $y = 2x$  21.  $y = 6x$  22.  $y = x$  23.  $y = x - 5$  24.  $y = 12 - \frac{1}{2}x$

Check your answers against the graph at the beginning of this chapter.

25. The Happy Hunting Company manufacture two brands of rifles, the Surefire and the Marksman. The cost of manufacturing the Surefire is  $1\frac{1}{2}$  times that of manufacturing the Marksman. Each rifle is sold for 3 times its manufacturing cost. If the selling price of the Surefire is \$36 more than that of the Marksman, find the cost of manufacturing each rifle.

## SECTION 2 Manipulation

## Addition

A *term* is an algebraic expression not separated by  $+$  or  $-$  signs; for example,  $7cd$ ,  $4sy$ ,  $10abc$ . A *like term* is a term which contains the same components:  $2ab$ ,  $4ab$  are like terms; but  $2bc$ ,  $bx$ ,  $xy$  are unlike terms. Like terms can be added as in arithmetic. The numbers can be either positive or negative, and the result can be a positive or negative quantity.

The rules for adding signed numbers are:

1. Positive numbers added together give a positive number.
2. Negative numbers added together give a negative number.
3. Find the absolute difference between two numbers with unlike signs and attach the sign of the number with the greatest absolute value.

*Example:* (a) Add:  $4a$ ,  $7b$ ,  $5c$ ,  $3a$ ,  $\frac{3}{4}b$ ,  $9a$ ,  $3\frac{1}{4}b$ ,  $4c$ ,  $6c$ ,  $3a$

Collect like terms:

$$4a + 3a + 9a + 3a = 19a$$

$$7b + \frac{3}{4}b + 3\frac{1}{4}b = 11b$$

$$5c + 4c + 6c = 15c$$

$\therefore 19a + 11b + 15c$  is the answer.

(b) Add:  $-3x$ ,  $-2y$ ,  $-4z$ ,  $-3y$ ,  $-2z$ ,  $-x$ ,  $-4x$ ,  $-2z$ ,  $-3y$

$$-3x - x - 4x = -8x$$

$$-2y - 3y - 3y = -8y$$

$$-4z - 2z - 2z = -8z$$

$\therefore -8x - 8y - 8z$  is the answer.

(c) Add:  $6x - 5y$ ;  $5y - 7x$ ;  $7x - 7y$ ;  $8y - 4x$ , and prove the answer by letting  $x = 1$  and  $y = 2$

Proof

$6x - 5y$	$6 - 10$	$=$	$-4$
$-7x + 5y$	$-7 + 10$	$=$	$+3$
$7x - 7y$	$7 - 14$	$=$	$-7$
$-4x + 8y$	$-4 + 16$	$=$	$+12$
<u><math>2x + y</math></u>	<u><math>2 + 2</math></u>		<u><math>+4</math></u>



## Subtraction

Like terms may be subtracted from each other as in arithmetic. The terms may be either positive or negative, and the result can be either positive or negative.

The rule for subtracting signed numbers is: *Mentally change the sign of the subtrahend and add.*

*Example:* Subtract  $7x + 3y + 11z$  from  $8x - 7y - 10z$  and prove the answer.

Proof: Let $x = 1, y = 2, z = 3$			
$8x - 7y - 10z$	$8 - 14 - 30$	$=$	$-36$
$7x + 3y + 11z$	$7 + 6 + 33$	$=$	$46$
<u><math>x - 10y - 21z</math></u>	<u><math>1 - 20 - 63</math></u>	$=$	<u><math>-82</math></u>

## Multiplication

An algebraic term such as  $4abc$  is composed of four *unlike factors*: 4, a, b and c. 4 is the *numerical coefficient*. A multiplication sign is understood between each factor, and the term may be written:  $4abc$ ,  $4 \times a \times b \times c$ , 4.a.b.c., 4bca, 4cab, etc. The arrangement of the factors in the term has no effect on the result. Unless the numerical values of a, b and c are known, we must leave the result as  $4abc$ .

The algebraic term  $x^3$  is composed of three like factors and can be written  $x \times x \times x$  or x.x.x. From our index laws we know that this is the *third power* of x and so use the shorthand form of  $x^3$ .

*Multiplication sign* has priority of treatment in any expression; i.e.,  $4 \times 2 + 6 \times 3 = 8 + 18 = 26$  (not  $4 \times 8 \times 3$ ).

The rules for the multiplication of signed numbers are:

1. If two numbers having like signs are multiplied, the result is positive.
2. If two numbers having unlike signs are multiplied, the result is negative.
3. If more than two numbers are multiplied together and the number of factors having a negative sign is even, the product is positive.
4. If more than two numbers are multiplied together and the number of factors having a negative sign is odd, the product is negative.

*Examples:* (a) Multiply:  $(+4xy^2z^3) (-5y^2z^2)$

$(+4xy^2z^3) (-5y^2z^2) = -(4 \times 5 \times x \times y \times y \times y \times y \times z \times z \times z \times z \times z)$ $= -20xy^4z^5$		
(b) Multiply $(x + 2y)(2y - 3x)$ and verify when $x = 1$ , $y = 2$ .		
$\begin{array}{r} x + 2y \\ -3x + 2y \\ \hline -3x^2 - 6xy \\ \hline \phantom{-3x^2} + 2xy + 4y^2 \\ -3x^2 - 4xy + 4y^2 \end{array}$	$\begin{array}{r} 1 + 4 \\ -3 + 4 \\ \hline \end{array}$	Proof $\begin{array}{r} = 5 \\ = 1 \\ \hline + 5 \\ \hline = 16 \\ = 5 \end{array}$
(c) Simplify $(-1)^7$ $= (-1) (-1) (-1) (-1) (-1) (-1) (-1)$ $= -1$		

*Brackets* in any expression indicate that the brackets contain one unit and the operation within the bracket must be performed first. The sign before the bracket is the sign for the operation of the complete unit. The signs within the bracket are signs of quality of each component. For example, in the problem,  $9 + 2 \times 4 = 9 + 8 = 17$ , the multiplication is done first; but in the problem,  $(9 + 2) \times 4 = 11 \times 4 = 44$ , the bracket operation is done first.

The rules are:

1. *Brackets preceded by a plus sign may be removed without a further change of signs.*
2. *To remove brackets preceded by a minus sign, remove the brackets and the sign of operation and change each sign of quality within the bracket.*

*Example:*  $(8x - 6y) - (-3x + 4y) = 8x - 6y + 3x - 4y = 11x - 10y$

## Division

Multiplication and division are inverse operations, and rules for dividing are exactly the same as for multiplication.



The rules for signed numbers are:

1. When numbers having like signs are divided, the quotient is positive.
2. When numbers having unlike signs are divided, the quotient is negative.

Examples:  $\frac{-4ab}{-2ab} = 2$

$$\frac{3x^3 - 6x^2 - x}{3x} = x^2 - 2x - \frac{1}{3}$$

## WORKOUT EXERCISE II

1. Add:  $-13ab^2$ ,  $-21ab^2$ ,  $-27ab^2$

2. Combine:

(a)  $-14m + 10p + 17n$ ;  $+13p + 25n - 11m$ ;  $21n - 34m + 27p$

(b)  $-5a - 9b + 11c$ ;  $-7b - 8a$ ;  $+6c - 2a$ ;  $+4c - 4b$

3. Simplify:  $2x^2 - 4xy - 2y^2 + 3 + 5x^2y^2 - 6x^2 + 11x - 4 + 3x^2y^2 - 6xy + 4x + 9 - 7x - 5y^2 + 12x^2y^2 - 6xy + 7y^2 + 5x^2$

4. Prove the additions in problems 1, 2 and 3 by assigning numerical values to algebraic symbols.

5. Subtract: (a)  $6a$  from  $-5a$ ; (b)  $-12ab - 4c^2 - 6d^2$  from  $8ab - 2c^2 - 4d^2$ ; (c)  $-21xyz$  from  $-17xyz$ . Assign numerical values to algebraic symbols to prove your answers.

6. Simplify: (a)  $x^2 - (4y^2 - 3yz + z^2) - (-3x^2 + 7yz + 3z^2) + 5yz$   
 (b)  $(5x^2 - y + z) - (-2x^2 + 3y + 4z) + 2xz$

Find the value of (a) and (b) when  $x = -1$ ,  $y = -2$ ,  $z = 3$ .

7. Give the product of:

(a)  $(+3)(-2)$

(b)  $(+6)(-4)(-3)$

(c)  $(+6)(+4)(+2)(-1)$

(d)  $(-2)(-3)(+1)(-2)(+1)$

(e)  $(x)^3(-y)^2$

(f)  $(ab^3)(-ab)^7$

(g)  $(-1)^6(-2)^3$

(h)  $x(x+1)(x-2)$

(i)  $(mn-2)(mn+2)$

(j)  $(a+b)^2 + (a-b)^2$

8. Divide: (a)  $18x^5y^2z^3 - 24x^3y^2z^2$  by  $-6x^2yz^2$

(b)  $\frac{5}{8}m^3n^2p - \frac{3}{8}m^2n^2p^2 + \frac{1}{8}mnp^3$  by  $-\frac{1}{8}mnp$

(c)  $12.5a^3b - 15.5ab^3 + 9.5a^2b^2$  by  $0.5ab$

(d)  $-22.8s^3t^3 - 13.2st^2 + 7.6s^2t$  by  $0.4st$

9. The new Corley Convertible car travels at  $x$  miles an hour. If driven for  $17x^3 - 4x^2 + 9x$  hours, how many miles will it have travelled?
10. Sarah lives  $7s^2 - 3t^2$  miles from school. If she leaves home at 8.15 a.m., how many miles an hour must she drive to arrive at school at 9 a.m.?
11. If  $3.5x$  gallons of gasoline can be purchased for  $\$(17.5x^4y^4 - 24.5x^2y^2 - 10.5xy)$ , how much will 15 gallons cost?

### SECTION 3      Formulae

A formula is a rule or a relationship which is expressed as an algebraic equation. Almost any statement of relationship can be expressed as an equation. For example, the following long sentence,

The net profit of a business is found by subtracting from the net sales the cost of the goods sold and the cost of the operating expenses.

can be expressed as an equation by lettering  $P$  = profit,  $S$  = sales,  $C$  = cost of sales, and  $E$  = expenses:

$$P = S - C - E$$

Now, if we know the value of every letter but one, we can solve for the unknown value. The axioms are used to manipulate the unknown value to the left-hand side of the equation.

Do you remember the meaning of Einstein's famous formula,  $E = mc^2$ , which led to the discovery of atomic energy? (Book I, page 155.)

*Example:* Last year the net profit of the Log Lumber Company was \$43,720.11. The cost of the sales was \$41,029.02. The operating expenses were \$17,783.23. If the sales returns were \$4,204.51, how much were (a) net sales; (b) gross sales? If the opening inventory was \$24,620.35 and the closing inventory \$33,236.74, how much (c) were net purchases?

- (a) Let  $P$  = net profit,  $S$  = net sales,  $C$  = cost of sales,  $E$  = expenses. Then  $P = S - C - E$ .

Add  $C$  and  $E$  to both sides:

$$\begin{aligned} S &= C + E + P \\ &= \$41,029.02 + \$17,783.23 + \$43,720.11 \\ &= \$102,532.36 \end{aligned}$$

- (b) Let  $G$  = gross sales,  $S$  = net sales,  $SR$  = sales returns. Then  $S = G - SR$

Add  $SR$  to both sides:

$$G = S + SR$$

$$= \$102,532.36 + \$4,204.51$$

$$= \$106,736.87$$

(c) Let C = cost of sales, OI = Opening inventory, CI = closing inventory, P = purchases.

$$\text{Then } C = OI + P - CI$$

Subtract OI from both sides; then add CI to both sides:

$$P = C - OI + CI$$

$$= \$41,029.02 - \$24,620.35 + \$33,326.76$$

$$= \$49,645.43$$

### WORKOUT EXERCISE III

Give the following statements as formulas stating what each letter used represents:

1. The net profit equals the gross margin less the operating expenses and the financial expense added to the financial income.
2. The amount equals the principal added to the interest earned.
3. The interest earned equals the principal invested times the rate of interest times the length of time invested.
4. The brokerage earned equals the sales times the rate of commission.
5. Find a formula for financial expense from the formula of problem 1 and express in words.
6. Find a formula for principal from problem 2 and express in words.
7. Find a formula for the rate of interest from the problem 3 formula and express in words.
8. Find a formula for the brokerage rate from the problem 4 formula and express in words.
9. The area of a rectangle is equal to the length times the breadth. State the formula and solve for the unknown when: (a)  $A = 36$  sq. ft.,  $l = 4$  ft.; (b)  $l = 6$  in.,  $w = 4$  in.; (c)  $w = 9$  yd.,  $A = 72$  sq. yd.
10. If the distance travelled is equal to the constant rate of travel times the time taken, give the formula and solve for the unknown when: (a)  $R = 60$  m.p.h.,  $T = 3\frac{1}{2}$  hours; (b)  $D = 800$  miles,  $T = 4$  hours; (c)  $D = 64$  ft.,  $R = 16$  ft. per sec.
11. Every straight line can be stated as an equation and plotted on graph paper. The value of  $y$  is known to equal a constant plus  $x$  times a second constant. State the formula and solve for  $x$ .
12. The sum due at the end of a simple interest investment period is equal to the principal plus the simple interest earned. The simple

interest earned is equal to the principal times the rate per annum times the time in years. Express the sum in terms of  $P$ ,  $r$  and  $t$ .

- (a) What will the sum amount to in 3 years if \$1,000 is invested at 6% per annum?
- (b) What principal will amount to \$600 in 6 months if interest is paid at 5%?
- (c) How long will it take \$400 to amount to \$500 at 4%?
- (d) What is the interest rate if \$504 earns \$20 in 9 months?

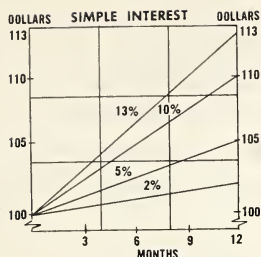
## SECTION 4     Figuring for Fun

1. The acknowledged father of algebra was an ancient Greek named Diophantus. Not very much is known about him, but a riddle telling the length of time he lived was written by a contemporary admirer. It is given below. Can you solve it?

Diophantus' youth lasted for  $\frac{1}{6}$  of his life; after  $\frac{1}{12}$  more of his life he grew a beard; after  $\frac{1}{7}$  more he got married and in 5 years had a son. This son lived exactly  $\frac{1}{2}$  as long as Diophantus and died four years before his father.

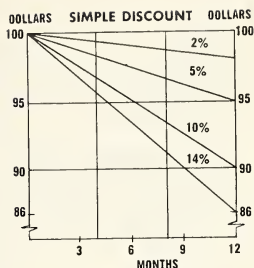
2. The honorary president, president, chairman, treasurer, and secretary of the Student Administrative Council met one afternoon after school. Their surnames, not in the above order, are: Nikola, Titov, Yuri, Popovich, and Gagarin. The boys' first names are: Bud, Hap and Glit; the girls' first names are: Pearl and Swoosie. The honorary president is the uncle of the president, Pearl. Gagarin borrowed Popovich's nail polish during the meeting. Bud instructed Yuri to read the financial report. Pearl is going steady with Nikola. Popovich is the chairman of S.A.C. Hap and Yuri play on the basketball team.

Name the honorary president, president, chairman, treasurer and secretary of the S.A.C.



# Simple Interest and Discount

## 2



### A Business Problem

Delta Wonder Drugs Limited, manufacturers of Wonder Diet Pills, find themselves short of available money and unable to take advantage of the discount terms of 2/10, n/30 allowed on the purchase of an automatic pill vending machine bought August 9 for \$2,400. They expect to have money available by September 9 to pay this account, but in the meantime they can obtain a short-term loan from their bank at a charge of 6½%. Would you advise the company to borrow the money? If so, why? If not, why not? How much would the company have to borrow? For how long? How much interest would they pay?

## SECTION 1 Simple Interest — Terms

*Interest*, denoted by (I), is the amount charged, or the rent paid, for the use of money. The amount to be charged will depend on the rate of interest, the amount of money borrowed, and the length of time the borrower has the use of the money.

*Principal*, denoted by (P), is the sum of money loaned and on which the interest is to be paid.

*Amount*, denoted by (A), is the sum of the principal and the interest paid on the principal during the period of the loan.

*Interest Rate*, or simply the *rate* denoted by (r), is the per cent of the principal that must be paid per year for the use of the principal. Unless stated to the contrary, the rate of interest is always understood to be an *annual rate*.

The formula for the amount is:

$$\text{Amount} = \text{Principal} + \text{Interest} \quad (1)$$

### WORKOUT EXERCISE I

The Creative Trust Company pay interest at 4½% per annum. What amount will be repaid to customers at the end of one year on the following sums? Estimate your answers first.

1. \$100

2. \$350

3. \$650

4. \$825	5. \$12.50	6. \$5.95
7. \$19.25	8. \$439.80	9. \$1,429.35
10. \$139.65	11. \$9.20	12. \$1,462.93
13. \$21,239.50	14. \$15,630.45	15. \$1,425,873.20

What principal must the customers deposit in the Golden Trust Company to receive the following amounts back at the end of the year if the company pay 6% per annum?

16. \$480.76	17. \$10.75	18. \$395.20
19. \$624.48	20. \$10.90	21. \$15.95
22. \$4,829,640.89	23. \$689,823.24	24. \$7.95

Questions for Discussion and Projects:

1. Discuss the conditions under which (a) an individual and (b) a family should borrow money.
2. When should a business concern borrow money?
3. Construct a bulletin board display for class discussion. Obtain pamphlets and forms by mail and from any lending institutions in your neighbourhood such as banks, credit unions and finance companies.
4. Explain to whom the interest charged on a loan is an expense and to whom it is income.
5. List and explain the four terms used in simple interest.
6. Construct a line graph to illustrate problems 5, 6, 7, 11, 17, 20, 21 and 24 above. See graph at chapter heading.

## SECTION 2 Simple Interest Formulae

The basic simple formula is:

$$I = P r t \quad (2)$$

Applying our rules for equations to formula (2), we obtain formulae for finding the principal, the rate, and the time:

$$P = \frac{I}{r \times t} \quad (3)$$

$$r = \frac{I}{P \times t} \quad (4)$$

$$t = \frac{I}{P \times r} \quad (5)$$



**WORKOUT EXERCISE II**

Using the basic simple interest formula, compute the simple interest and the amount for the following periods. Estimate your answers first.

	<i>Rate of Interest</i>	<i>Time</i>	<i>Principal</i>
1.	6½%	365 days	\$ 420.80
2.	3%	4 months	1,416.98
3.	2½%	61 days	54.27
4.	7½%	292 days	163.45
5.	4½%	17 days	7,948.26
6.	4%	3 months	978.68
7.	5%	511 days	3,763.42
8.	4%	9 months	19.20
9.	4 <sup>7</sup> / <sub>16</sub> %	212 days	53.28
10.	2½%	146 days	312,811.11
11.	6%	511 days	428.24
12.	1¼%	876 days	197.98
13.	4 <sup>7</sup> / <sub>8</sub> %	73 days	178.80
14.	5½%	5½ months	4,320.65
15.	2 <sup>5</sup> / <sub>8</sub> %	146 days	1,028.06
16.	3¾%	3¾ months	17.53
17.	12%	1 month	412.98
18.	1½%	8 months	63.48
19.	2½%	61 days	516,412.18
20.	3½%	16 months	2,028,327.16

**WORKOUT EXERCISE III**

Find the principal in each of the following cases. Estimate your answers first.

	<i>Interest</i>	<i>Rate</i>	<i>Time</i>
1.	\$ 110.00	5½%	365 days
2.	48.29	3%	4 months
3.	937.64	5%	73 days
4.	839.77	4%	3 months
5.	34.80	6%	292 days
6.	7,070.17½	8 <sup>3</sup> / <sub>8</sub> %	7 months
7.	2,859.63	15%	73 days
8.	71,151.00	12½%	18 months

	<i>Interest</i>	<i>Rate</i>	<i>Time</i>
9.	50,222.25	4¼%	876 days
10.	33,702.48	4%	9 months
11.	.75	6⅞%	3½ months
12.	94.24	3⅞%	16 months
13.	1,588.62	7¼%	219 days
14.	16.11	6¾%	10 months
15.	704.00	8¾%	7½ months
16.	23.03	5⅞%	8¾ months
17.	60.97	4⅞%	65 days
18.	.33	9⅞%	5½ months
19.	1,032.08	4⅞%	292 days
20.	3.80	6¼%	9½ months

#### WORKOUT EXERCISE IV

Find the rate, correct to two decimal places, in each of the following cases. Estimate your answers first.

	<i>Principal</i>	<i>Interest</i>	<i>Time</i>
1.	\$ 1,150.00	\$ 30.93	219 days
2.	18.90	1.89	3 months
3.	540.75	7.45	54 days
4.	30,176.50	513.25	3¾ months
5.	976.20	9.76	4 months
6.	720.18	8.42	95 days
7.	65,081.50	208.30	73 days
8.	1,528.75	16.90	5 months
9.	462.90	33.80	6½ months
10.	250,820.16	82,020.20	100 days
11.	3,829.10	4.28	1 year
12.	14,391.21	150.45	146 days
13.	45,828.00	902.76	9 months
14.	749.80	10.60	2 months
15.	1,638.15	100.52	292 days
16.	9,076.32	168.20	99 days
17.	53,020.00	496.80	657 days
18.	684.00	58.55	7 months
19.	7,382.16	101.25	135 days
20.	962.83	107.32	11 months



## WORKOUT EXERCISE V

Find the time to the nearest day in each of the following instances. Estimate your answers first.

	<i>Interest</i>	<i>Principal</i>	<i>Rate</i>
1.	\$ 8.20	\$ 1,640.00	4½%
2.	9.90	357.40	6¼%
3.	17.00	1,040.96	3¼%
4.	13.80	1,286.10	7¾%
5.	104.28	3,146.80	2⅛%
6.	29.00	6,240.80	4⅜%
7.	156.42	4,720.20	5¾%
8.	24.42	796.00	9¼%
9.	51.00	13,441.00	7⅛%
10.	5.75	164.25	6¼%
11.	1.50	52.80	2¾%
12.	3.40	920.20	4¼%
13.	3.50	198.40	11⅛%
14.	4.10	473.65	8¼%
15.	11.60	705.00	7¾%
16.	82.40	3,041.00	9½%
17.	15.00	4,481.00	1¼%
18.	59.40	2,144.00	6¼%
19.	1.75	59.20	3½%
20.	9.20	857.40	11⅛%

21. Chester Lemieux wishes to provide an annual scholarship of \$4,050 for study in Paris by means of an endowment fund. If the fund can earn 4¼%, how much, to the nearest dollar, must Chester put in the endowment fund?

22. When Carl Junior is one year old, his father Carl Senior invests sufficient funds to provide \$6,000 for Carl Junior's university education, to be paid on his eighteenth birthday. If the investment earned 4¼% simple interest, how much did Carl Senior invest?

23. Jennings Harness and Tackle Limited purchase a new machine for the manufacture of dog harnesses for \$2,600. The terms of purchase are 2/10, n/30. Is it cheaper to borrow the money from the bank at 6% interest to pay the bill at the end of 10 days, or wait and pay it at the end of 30 days when funds will be available? How much does the company save using the cheaper method?

24. McSqueaky Clean Limited can borrow \$1,480 from the bank for 3 months at  $6\frac{1}{2}\%$  interest, or they can borrow from the Associated Marine Loan Company and repay the loan in four equal monthly payments plus  $\frac{1}{2}\%$  per month interest charge on the unpaid balance. Which method would have the highest per annum interest charge? How much higher? Would the interest charge be the only reason for making the decision? Explain.

25. Crocker and Smythe Limited obtain a 146-day loan of \$795.50 on May 6 from the Associated Marine Loan Company on which they pay  $7\frac{3}{4}\%$ . How much did it cost them to borrow this money? How much did they repay?

26. Sheaffer and Sons Company paid interest charges to the Associated Marine Company of \$615.04 for a loan of \$9,920 which they had for 292 days. What was the rate of interest charged?

27. The sales of the Deep Sea Buoy Company are seasonal, and the company is in need of a short term loan. If they borrow \$1,040.96 on which they pay  $8\frac{1}{2}\%$  interest amounting to \$17.00, for how long do they have the loan?

28. Construct line graphs to prove your answers to any five of the problems 1 - 20 above.

### SECTION 3 Simple Discount

When we borrow money and pay interest on it, we obtain the full value of the loan and pay the interest when we pay back the loan at the end of the period. We can, however, also borrow money by paying the interest on the loan at the time we borrow the money. In this case the interest charged on the loan is called *discount*, denoted by (D).

The *rate of discount*, denoted by (d), is always based on the amount or sum; thus, the formula for finding the discount is:

$$D = A \times d \quad (6)$$

When the time involved is other than one year, this formula becomes:

$$D = A \times d \times t \quad (7)$$

where (t) is the time in years.

The *proceeds* we receive, denoted by (p), are found by subtracting the discount charged from the amount of the loan, or:

$$p = A - D \quad (8)$$

## WORKOUT EXERCISE VI

Calculate the simple discount charge and the amount of the proceeds for the following:

	<i>Amount</i>	<i>Discount Rate</i>	<i>Time</i>
1.	\$ 536.00	4%	3 months
2.	4,328.10	4½%	19 days
3.	842.30	5¼%	212 days
4.	1,042.60	5½%	511 days
5.	19.75	6½%	292 days
6.	782.35	7%	61 days
7.	672.25	3%	4 months
8.	1,076,328.25	7¼%	146 days
9.	473.50	4½%	4½ months
10.	330.30	3¾%	300 days
11.	50.75	1½%	8 months
12.	12,760.26	4¾%	73 days
13.	628.40	12%	1 month
14.	360.18	2¼%	876 days
15.	19.95	4%	9 months
16.	83.90	3⅝%	93 days
17.	928.20	4⅛%	150 days
18.	800.10	8%	3 months
19.	750.50	6¼%	85 days
20.	5,098.75	6¾%	64 days

21-27. Draw a line graph to prove your answers to problems 1, 7, 9, 11, 13, 15 and 18.

## SECTION 4 Promissory Notes

A *promissory note* is a written unconditional promise made and signed by one person, called the *maker*, to pay a certain sum of money to the lender, called the *payee*, at a future fixed or determinable date. If interest is to be paid, the rate will be stated. The date on which the money is due is the *maturity date*; the amount of money due is called the *maturity value*.

The *face* of the note is the amount of money mentioned in the note; this may be the same as the maturity value in a non-interest-bearing note, or different as in the case of an interest-bearing note. The *period* of the note is the length of time for which the money is borrowed. The *date of the note* is the date the note is signed.

Figure 2-1 is an example of an interest-bearing promissory note. The maturity value of an interest-bearing promissory note is the face value of the note plus the required interest based on the face value (i.e.,  $\$500.00 + \$6.04 = \$506.04$ .)

**Figure 2-1      An Interest-Bearing Promissory Note**

<b>BANK OF MONTREAL</b>	1-2 TORONTO 1, ONT. MAIN OFFICE - KING & BAY STREETS (BRANCH)		$\$$ 500.00 $\$$ 6.04 $\$$ 506.04	
	Due May 22, 19 -		March 20 19 -	
	Sixty days		after date 1	
	to the order of		Arthur Jones	
the sum of		Five Hundred..... <sup>00</sup> / <sub>100</sub> Dollars		
with interest at the rate of 7		per cent per annum, as well after as before		
maturity, minimum charge \$		at the Bank of Montreal		
here. Value received.				
		Jack Bowling		

## WORKOUT EXERCISE VII

1. Draw up promissory notes for the loans made in Workout Exercise II, problems 21 and 22.
2. Draw up promissory notes for the loans made in Workout Exercise III, problems 21 and 22.
3. Draw up promissory notes for the loans made in Workout Exercise IV, problems 21 and 22.

Notes: 1. Omit the maturity date.

2. A company will use 'we' instead of 'I'.

3. Signature will include the name of the company and a signing officer, e.g.,

Reynolds Steel Company,  
per *J. S. Timmis*  
General Manager.

4. Keep these promissory notes for the next exercise.

## Finding the Maturity Date

The maturity date on a promissory note may be stated in days, months or years. If the period is stated in years, the due date is calculated by counting the years from the date of the note and adding three days of grace. For example, a two-year note dated July 10 is due July 13 two years later.

If the period is stated in months, the due date is calculated by counting the months from the date of the note and adding three days of grace. For example, a two-month note dated February 27 would be due on April 30 in the same year. A one-month note dated January 31 is due March 3 (February 28, or 29 in leap year, plus 3 days.)

If the period is stated in days, the due date is calculated by counting the exact number of days from the date of the note and adding three days of grace to this date.

### WORKOUT EXERCISE VIII

1. Find by the calculation method the maturity dates of the six promissory notes drawn up in Workout Exercise VII and insert the dates in the respective notes. Use today's date if none given.
2. Assume each of the promissory notes in Workout Exercise VII was paid on the due date. Receipt each note. What happens to the note after being receipted?

Questions for Class Discussion:

3. What is a promissory note? When is it used? List and explain the terms.
4. What is the legal due date of a promissory note according to Canadian Law?
5. Explain the difference between an interest-bearing and a non-interest-bearing promissory note.
6. Trace the ownership of a promissory note from the moment it is signed until the debt is paid.

## SECTION 5 Estimating the Answer

It is often suggested in the Workout Exercises that you estimate your answers roughly before proceeding with the formal solutions to the problems.

Here is a method you can use to quickly estimate interest charges: 60 days are approximately  $\frac{1}{6}$  of a year; and if the rate of interest is 6%, then the interest for  $\frac{1}{6}$  of a year at 6% is:

$$P \times \frac{6}{100} \times \frac{1}{6} = \frac{1}{100} \text{ of } P.$$

To use this method, move the decimal point in the principal two places to the left and then adjust roughly for the change of time and percentage in the problem.

**WORKOUT EXERCISE IX**

Estimate the answers to all of Workout Exercise II by the above method.

**SECTION 6 Figuring for Fun**

1. Here are some interest quickies.

In each of the following cases all you do is move the decimal place in the principal two places to the left. Suppose we invest \$375.00 for:

$$4 \text{ months at } 3\% \text{ per annum } \left( 375 \times \frac{4}{12} \times \frac{3}{100} \right) = \$3.75$$

$$3 \text{ months at } 4\% \text{ per annum } \left( 375 \times \frac{3}{12} \times \frac{4}{100} \right) = \$3.75$$

$$2 \text{ months at } 6\% \text{ per annum } \left( 375 \times \frac{2}{12} \times \frac{6}{100} \right) = \$3.75$$

$$1 \text{ month at } 12\% \text{ per annum } \left( 375 \times \frac{1}{12} \times \frac{12}{100} \right) = \$3.75$$

From these basic figures we can calculate others:

If you multiply the time and divide the rate, e.g.,

$$8 \text{ months at } 1\frac{1}{2}\% \left( 375 \times \frac{8}{12} \times \frac{3}{200} \right) = \$3.75.$$

If you multiply the time and the answer by the same figure, e.g.,

$$9 \text{ months at } 4\% = \$3.75 \times 3 = \$11.25.$$

If you divide the time and the answer by the same figure, e.g.,

$$1 \text{ month at } 3\% = \$3.75 \div 4 = \$0.94.$$

Recalculate Workout Exercise II, questions 3, 4, 6, 9, 12, and Workout Exercise III, questions 3, 7, 15, to see how fast you can do them.

2. Let's try a cryptography cipher:

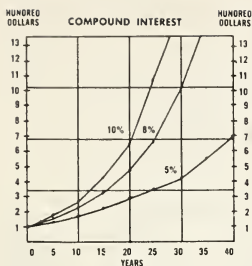
Take a word, sentence or phrase having 13 different letters, such as "making trouble". Use this phrase twice, once as small letters and once as capitals; e.g.,

m a k i n g t r o u b l e M A K I N G T R O U B L E  
a b c d e f g h i j k l m n o p q r s t u v w x y z

Now substitute the cipher letters for the letters of the message. Make your own cipher.

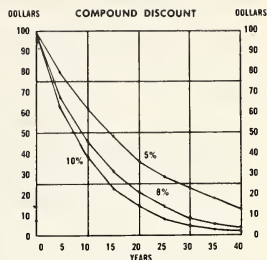
r m O n g R M





# Compound Interest and Discount

## 3



### A Business Problem

Broderick Brady owns the Brady Dog Boutique which is located in a fashionable block of a small city. Mr. Brady also owns about half of the block, and he rents for \$15,000 a year the sections of his property not used up by the Dog Boutique. His total income averages \$30,000 a year.

Mr. Brady has had two offers to purchase his business and one offer to purchase the business and the property. The first offer is for \$100,000 cash and \$300,000 in ten years. The second offer is for \$200,000 cash, \$70,000 in five years, and \$110,000 in fifteen years. The offer to purchase the business and the property is for \$250,000 cash, \$250,000 in five years, and \$240,000 in eight years.

Mr. Brady has asked you to study the problem and advise him as to his best course of action. Money is worth 6% per annum.

## SECTION 1 Long-Term Financing

Many businesses have to borrow money for periods of ten, twenty, twenty-five years. It is unlikely that they could obtain loans for such long periods on a simple interest basis; that is, interest based on a principal which remains the same. The reasons are obvious when we consider a long-term loan from the lender's point of view.

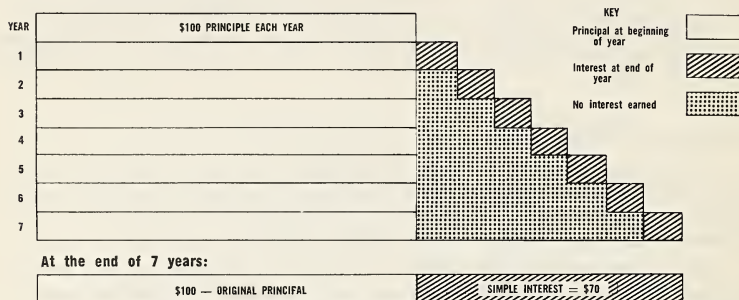
For example, if you lend for several years \$100 at 10% per annum, simple interest, the interest charge for one year will be \$10; for two years, \$20; for three years, \$30; etc. Thus at the end of one year your investment will be worth \$110; at the end of two years, it will be worth \$120; at the end of three years, \$130; etc., as shown in figure 3-1 (a). But if at the end of the first year you take the \$110 owing to you and lend it to someone else at 10% interest for a year, the \$110 will earn for you \$11 in one year instead of \$10. Then at the end of the second year you will receive \$121 in payment of the \$110 loan; and again you can lend the \$121 at 10% interest for a year. This time the \$121 (instead of the original \$100) will earn for you \$12.10 (instead of the original \$10). Thus each year the principal you lend, upon which the interest is calculated, increases and in

turn earns more interest for you. This is the principle of compound interest, shown graphically in figure 3-1 (b).

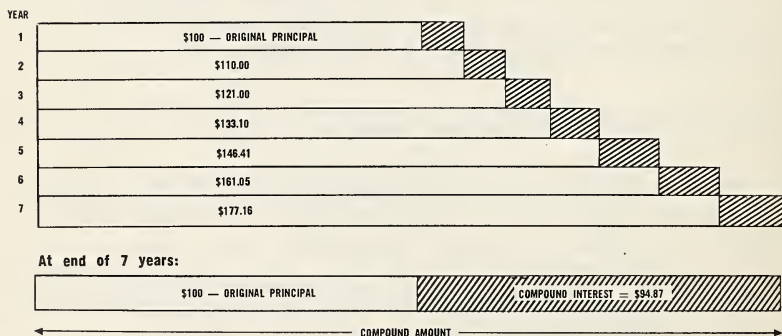
**Figure 3-1 Comparison of Simple and Compound Interest**

*\$100 is invested at 10% p.a. for 7 years*

(a) *at Simple Interest*



(b) *at Compound Interest*



Normally, therefore, simple interest is used only for short-term loans, usually under one year, and long-term financing is negotiated on the compound interest basis.

## SECTION 2 Compound Interest

Compound interest is really simple interest computed both on the interest earned during a previous period and on the principal. Interest is calculated at the end of a predetermined period on the outstanding principal at the beginning of that period. This interest is added to the principal and becomes part of the outstanding principal at the beginning of the second period. The new principal is used as



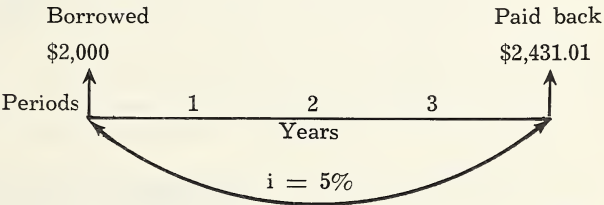
the base upon which to calculate the interest for the succeeding period; this is shown graphically in figure 3-1(b). When such periodic additions are made to the principal, the interest is said to be compounded.

*Example:* Ralph Scott borrowed from his uncle, John Deeks, \$2,000 for a period of four years to help him defray his college expenses. The money was borrowed at 5% per annum, compounded annually.

How much did Ralph Scott have to pay back to his uncle at the end of the four years?

Principal borrowed, beginning of first year	\$2,000.00
Interest charge, 5% of \$2,000	100.00
Principal, beginning of second year	\$2,100.00
Interest charge, 5% of \$2,100	105.00
Principal, beginning of third year	\$2,205.00
Interest charge, 5% of \$2,205	110.25
Principal, beginning of fourth year	\$2,315.25
Interest charge, 5% of \$2,315.25	115.76
Amount to be repaid, end of fourth year	<u>\$2,431.01</u>

Figure 3-2



When money is invested at compound interest, it will, in a comparatively short period of time, double itself. For example, if \$100 is invested at 5½% per annum, it will double itself in thirteen years as shown in figure 3-3.

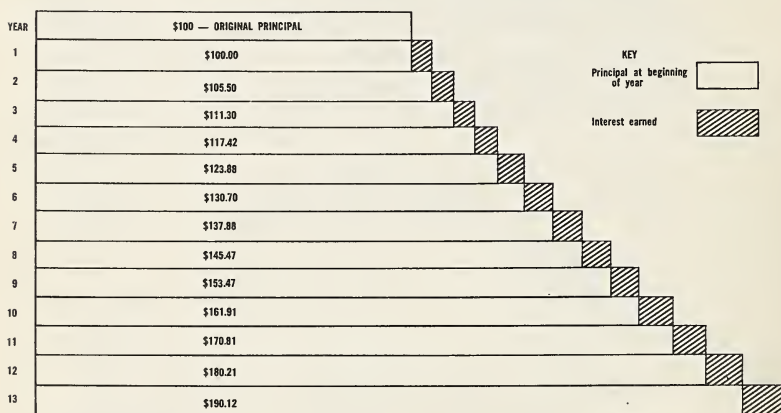
WORKOUT EXERCISE I

Find the amount, to the nearest cent, to be repaid on the following loans. Construct a time line for each problem.

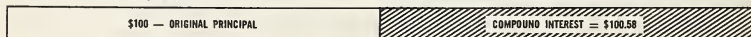
	Principal Borrowed	Time	Compound Interest Rate
1.	\$3,500	3 years	6% per annum
2.	\$5,525	2 years	12% per annum

- |     |  |                      |   |
|-----|--|----------------------|---|
| 3.  | \$1,250  | 3 months             | $1\frac{1}{2}\%$ per month              |
| 4.  | \$758  | 4 months             | $\frac{1}{2}\%$ per month               |
| 5.  | \$2,540  | 2 years              | $4\frac{1}{2}\%$ per $\frac{1}{2}$ year |
| 6.  | \$1,575  | $2\frac{1}{2}$ years | $5\%$ per $\frac{1}{2}$ year            |
| 7.  | \$858  | $1\frac{1}{2}$ years | $3\%$ per $\frac{1}{4}$ year            |
| 8.  | \$1,172  | $1\frac{1}{4}$ years | $3\%$ per $\frac{1}{4}$ year            |
| 9.  | \$10,000   | $2\frac{1}{3}$ years | $4\%$ per $\frac{1}{3}$ year            |
| 10. | \$15,500   | $1\frac{2}{3}$ years | $3\%$ per $\frac{1}{3}$ year            |
| 11. | Illustrate any five of the above problems graphically. |                      |   |

**Figure 3-3      \$100 Invested At  $5\frac{1}{2}\%$  P.A. For 13 Years**



At the end of 13 years:



### SECTION 3      Compound Interest Terms

*Compound Amount* is the total amount due at the end of the loan. It is composed of the original principal plus the total of all the earned interest.

*Compound Interest* is the total of all the earned interest. It is the compound amount minus the original principal.

*Conversion Period* is the period of time elapsing between two successive additions of interest to the principal.

*Term* is the length of time of the loan and is always expressed in terms of conversion periods.

## WORKOUT EXERCISE II

1. Discuss the difference between simple interest and compound interest. List three uses for each kind of interest.
2. Name and explain the terms used in compound interest problems.
3. Is a conversion period necessarily one year? Explain.
- 4-13. Name the compound amount, the compound interest, the conversion period, and the term in each of the problems 1-10 in Workout Exercise I.
14. Draw a graph to illustrate the difference between \$100 invested at 10% simple interest for 7 years and \$100 invested at 10% compound interest for 7 years. (See figure 3-1 (a) and (b).)

## SECTION 4 Compounding Interest More Often Than Yearly

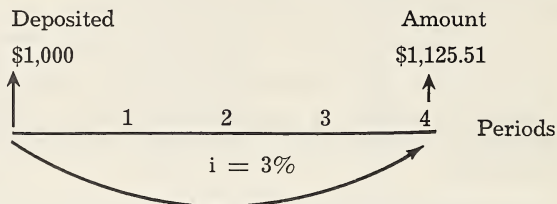
A rate of interest is always quoted on an annual basis, but the interest is often compounded into principal on a semi-annual, quarterly or monthly basis. That is, a rate may be quoted as: 6% per annum, compounded quarterly. This means that the interest earned in three months ( $\frac{1}{4}$  of 6%, or  $1\frac{1}{2}\%$ ) is added to the principal after each three-month period; therefore in one year four conversions of  $1\frac{1}{2}\%$  interest have taken place instead of one 6% conversion.

*Example:* On January 1st Paul Holmes deposited \$1,000 in the Home Trust Company. If the money earned 6%, compounded semi-annually, how much would Paul have at the end of the second year?

Principal deposited, January 1, 1st year	\$1,000.00
Interest earned, July 1, ( $\frac{1}{2}$ of 6%), 3% of \$1,000	<u>30.00</u>
	1,030.00
Interest earned, January 1, 2nd year, 3% of \$1,030	<u>30.90</u>
	1,060.90
Interest earned July 1, 2nd year, 3% of \$1,060.90	<u>31.827</u>
	1,092.727
Interest earned January 1, 3rd year, 3% of \$1,092.727	<u>32.782</u>
	<u><u>\$1,125.509</u></u>

∴ The compound amount Paul would have after two years would be \$1,125.51.

**Figure 3-4**



The interest rate is always quoted on an annual basis, but the term is quoted in conversion periods; so the interest must be changed to "interest per conversion period".

In the above example the interest rate is 6%, but as it is compounded semi-annually there are four conversion periods in the two years. If the interest rate is 6% for one year, it is 3% for one half-year or 3% per conversion period. To find the interest rate per conversion period, divide the given annual rate by the number of conversion periods in one year; in this case,  $6\% \div 2 = 3\%$ . If the interest rate is 5%, converted four times a year, the rate per conversion period is  $5\% \div 4 = 1.25\%$ ; a rate of 6% per annum converted monthly is  $6\% \div 12 = 0.5\%$  per conversion period.

### WORKOUT EXERCISE III

State the compound interest rates in Workout Exercise I as an annual interest rate with the number of conversion periods per year.

## SECTION 5 Compound Amount — Tables

As can be seen from the preceding examples, calculations for compounding interest would become very long and laborious if it were necessary to calculate the interest for many periods. Consequently, to eliminate the necessity of calculating each rate of compound interest, tables have been compiled based on the theory just described. Figure 3-5 is an example of a compound interest table. Further tables are given at the back of the book. The tables all show how much \$1.00 will amount to if compounded for a given number of periods at a given rate of interest. Banks and other financial institutions use tables of this kind extensively in their interest calculations.

**Figure 3-5                      A Compound Interest Table**

Amount of \$1.00 Compounded Periodically				
Period	1%	2%	3%	4%
1	1.010000	1.020000	1.030000	1.040000
2	1.020100	1.040400	1.060900	1.081600
3	1.030301	1.061208	1.092727	1.124864
4	1.040604	1.082432	1.125509	1.169859
5	1.051010	1.104081	1.159274	1.216653
6	1.061520	1.126162	1.194052	1.265319
7	1.072135	1.148686	1.229874	1.315932
8	1.082857	1.171659	1.266770	1.368569
9	1.093685	1.195093	1.304773	1.423312
10	1.114622	1.218994	1.343916	1.480244
11	1.115668	1.243374	1.384234	1.539454
12	1.126825	1.268242	1.425761	1.601032
13	1.138093	1.293607	1.468534	1.665074
14	1.149474	1.319479	1.512590	1.731676
15	1.160969	1.345868	1.557967	1.800944
16	1.172579	1.372786	1.604706	1.872981
17	1.184304	1.400241	1.652848	1.947900
18	1.196147	1.428246	1.702433	2.025817
19	1.208109	1.456811	1.753506	2.106849
20	1.220190	1.485947	1.806111	2.191123

**To Find the Compound Amount**

*Example:* Find the compound amount of \$1.00 invested for 10 years at 6%, compounded semi-annually.

---

Number of periods =  $10 \times 2 = 20$  periods

Interest per period =  $6 \div 2 = 3\%$

In the column headed "Period" find 20 which is the number of periods for which the money is invested.

Proceed along this row to the column headed 3%. This will be the required amount.

$\therefore$  In 10 years \$1.00 invested at 6% compounded semi-annually would amount to \$1.81.

If more than \$1.00 is invested, it will be necessary to multiply the

compound amount by the number of dollars invested. In the above example if \$450 had been invested, then the amount would be  $\$450 \times 1.806111 = \$812.75$ . That is, \$450 invested for 10 years at 6%, compounded semi-annually, would amount to \$812.75.

### To Find the Compound Interest

The compound interest table gives the compound amount of \$1.00 at a given rate of interest for a given period of time. To find the compound interest, subtract the original principal of \$1.00.

*Example:* A university endowment fund invested \$25,000 in securities paying 4% per annum, compounded quarterly. How much interest will be available for a scholarship at the end of 3 years?

Number of periods,  $3 \times 4 = 12$  periods

Interest per period  $= 4 \div 4 = 1\%$

From the table, figure 3-5:

\$1.00 invested for 12 periods at 1% = \$1.126825

\$25,000 invested for 12 periods at 1% =  $\$25,000 \times 1.126825$   
= \$28,170.62

Compound interest:

$\$28,170.62 - \$25,000 = \$3,170.62$

$\therefore$  \$3,170.62 will be available for a scholarship at the end of 3 years.

### WORKOUT EXERCISE IV

Using the compound interest tables, find to the nearest cent the compound amount and the compound interest for the following. Draw a time line for each problem:

1. \$375.75 at 5% compounded quarterly for 10 years.
2. \$1,029.50 at 6% compounded monthly for 5 years.
3. \$789.90 at  $4\frac{1}{2}\%$  compounded semi-annually for  $11\frac{1}{2}$  years.
4. \$345.10 at  $3\frac{1}{2}\%$  compounded semi-annually for 24 years.
5. \$10,500.25 at  $2\frac{1}{4}\%$  compounded yearly for 50 years.
6. \$150,275.35 at  $1\frac{3}{4}\%$  compounded semi-annually for  $12\frac{1}{2}$  years.
7. \$975,028.15 at 9% compounded semi-annually for  $7\frac{1}{2}$  years.
8. \$9.50 at 10% compounded quarterly for  $10\frac{1}{2}$  years.



9. \$17.75 at 12% compounded monthly for 12 years.
10. \$9,000.90 at 6% compounded quarterly for  $8\frac{1}{2}$  years.
11. Silas Jones deposited \$100 in a trust account for each of his children the day they were born to be paid to them on their twenty-first birthday. If the fund earned  $4\frac{1}{2}\%$ , compounded semi-annually, how much did each child receive on his twenty-first birthday?
12. Grandfather Murphy willed his three grandchildren \$250 to be kept in trust until their eighteenth birthday. When grandfather died, Joanne was 4 years old, James was  $7\frac{1}{4}$  years old, and Norman was  $8\frac{1}{2}$  years old. If the money earned 6%, compounded quarterly, how much did each child receive on his eighteenth birthday?
13. James Defoe donated \$25,000 to a building fund for the Health and Fitness Academy stipulating that a gymnasium should be built with the proceeds of the fund in ten years. If the fund earned 5%, compounded quarterly, how much was available to build the gymnasium at the end of the tenth year?
14. Joanna Wells left in her will \$309,300 to nuclear research. One-third of the principal was to be paid to the Nuclear Commission in five years, one-third in ten years, and the remaining third in fifteen years. If the money was invested at 7%, compounded semi-annually, how much was paid to the commission in five years? In ten years? In fifteen years?
15. Peter Crawford wished to establish a trust fund for his son Raymond's university education. He created a trust fund paying 6%, compounded semi-annually, and deposited in it \$500 on each of Raymond's first, fifth, tenth, and fifteenth birthdays. If Raymond could withdraw the proceeds on his nineteenth birthday, how much would be available for his education?
16. Luella Forsythe, a wealthy widow, left her entire estate in trust for 50 years. At the end of that time it was to be used to sponsor a Canadian expedition to the moon; the expedition was to be called Expedition Forsythe. If she left  $2\frac{1}{2}$  million dollars and the money was invested at  $4\frac{1}{2}\%$ , compounded semi-annually, how much would be available at the end of 50 years for Expedition Forsythe?
17. The day Jacob Miller's grandchild Sally Ann was four years of age, he deposited \$12,000 in a trust fund so that Sally Ann could have a helicopter on her twenty-first birthday. If the fund earned 5%, compounded quarterly for  $5\frac{1}{4}$  years,  $4\frac{1}{2}\%$  compounded annually for 4 years, and 4% compounded quarterly for the balance of the time, how much was available on Sally Ann's twenty-first birthday to purchase a helicopter?

18. The Arctic Oil Research Syndicate was formed by three individuals. Sam Snead invested in the Syndicate the proceeds of a legacy from his grandfather which consisted of \$5,560 invested 10 years ago at 6% compounded semi-annually for 5 years, and at 5% compounded quarterly for 5 years. Tom Witterson invested the proceeds of an annuity which  $4\frac{1}{2}$  years ago amounted to \$4,500 and had been invested since then at 3% compounded monthly. Bob Ritter invested \$10,000. What was the total investment of the Arctic Oil Research Syndicate?

19. Jack and Jacqueline Newport each inherited \$9,500 from their grandmother. Jack invested his inheritance in a trust company which for 5 years paid 4% interest compounded quarterly, and then  $4\frac{1}{2}$ % compounded semi-annually. Jacqueline invested her money at  $4\frac{1}{2}$ % per annum. Who had more money and how much more at the end of 10 years?

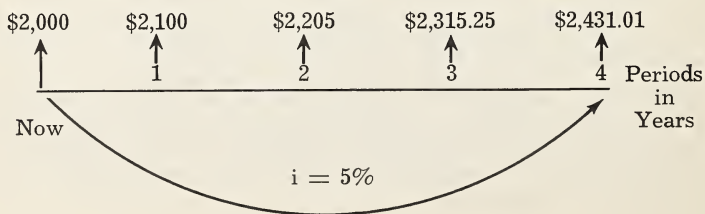
20. Louise Bowling won a large amount of money in a sweepstake and decided to take a trip around the world. However, she wished to invest some of her money in a trust to be paid to her when she retired at 65 years of age. If she invested \$45,000 on her thirty-fifth birthday at  $4\frac{1}{2}$ % compounded semi-annually for ten years, and at 5% compounded quarterly for the balance of the time, how much was in the fund on her sixty-fifth birthday?

21. From the compound interest tables draw a graph showing the amount of \$1.00 compounded at 5% for twenty periods. Take figures to the nearest cent.

## SECTION 6 Present Worth

Until now our problems have required us to find the future value of a sum of money which is loaned or invested today. We have discovered that this money increases or accumulates as time progresses. For example, if \$2,000 is invested for four years at 5% per annum, compounded annually, we draw our time line as follows:

**Figure 3-6 Compound Interest Time Line**

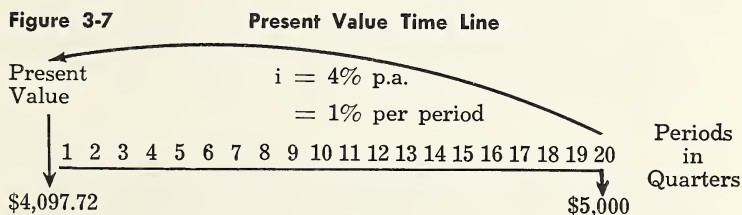




We see from this diagram that the compound amount increases at the end of each interval as we move to the right along the time line, or move from the present into the future. Moreover, for this particular principal at the specified rate of interest, the compound amount is fixed at any particular point on the time line. Therefore, if we know the compound amount at any point of time and the rate of interest applying, we can move forward or backward along the time line to find the compound amount at any other point of time.

It is frequently necessary to calculate the *present worth*, or the value today, of a sum of money which is due at a fixed future date. Therefore, if we know the amount at a future date and wish to know the value today, we must move backwards along the time line the required number of periods. Figure 3-6 shows that the value today is less than it will be in four years. The value to-day is the amount which, if invested immediately, would earn interest and increase in value to exactly equal that certain sum due at the fixed future date (i.e., in four years).

Let us assume that we wish to have \$5,000 available in five years and that we know we can invest money at 4% compounded quarterly. How much must we deposit today so that it will accumulate to \$5,000 in five years? The time line in figure 3-7 illustrates this problem.



Therefore, if we invest \$4,097.72 today at 4% p.a., compounded quarterly, at the end of five years we will have the required \$5,000.

### Calculating the Sum at a Future Date (S)

Assume we know the principal, or the value today, (P); the rate of interest (i); and the future date. We wish to find the sum at a future date (S).

Proceed as follows: Find from the tables the compound amount which \$1.00 would become at the known rate of interest for the known time. Use this amount as a factor by which to multiply the original principal.

The amount that \$1.00 becomes at a given rate of interest in a given time is called the *accumulation factor*. The formula to find

the sum at a future date is therefore:

$$S = P \times \text{Accumulation factor} \quad (1)$$

### Calculating the Present Worth (P)

To find the present worth (P) when we know the future amount (S), we reverse this procedure and *divide* the future amount (S) by the accumulation factor. Therefore, divide both sides of formula (1) by the accumulation factor to derive the formula for the present worth:

$$P = \frac{S}{\text{Accumulation factor}} \quad (2)$$

For example, in figure 3-7, \$5,000 is the amount at the end of 20 periods with interest at 1% per period. From figure 3-5 we see that the compound amount of \$1.00 invested for 20 periods at 1% is \$1.22019 (the accumulation factor). The present value of \$5,000 at the beginning of 20 periods is, therefore, from formula (2):

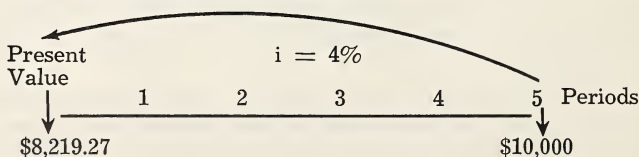
$$P = \frac{\$5,000}{\$1.22019} = \$4,097.72$$

Figure 3-7 shows this on the time line.

*Example:* J. D. Hogarth has advertised his house for sale and has received two offers. The first offer is for \$4,000 cash and \$10,000 to be paid in 5 years. The second offer is for \$5,000 cash and \$9,100 to be paid in 6 years. If money can be invested at 4% compounded annually, which is the better offer?

*Note:* To compare two amounts of money, we must always bring both amounts to the same point of time on the time line because no sum of money remains static in value but has a different value at different times (as indicated in figure 3-6). In this case, we find today's present worth of both offers.

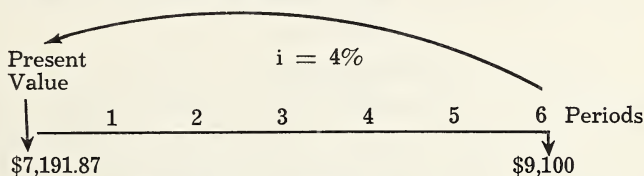
Present worth of the first offer:



From figure 3-5, \$1.00 invested at  
4% for 5 years = \$1.216653  
(accumulation factor)

$$\begin{aligned}
 \therefore P &= \frac{\$10,000}{1.216653} \\
 &= \$8,219.27 \\
 \therefore \text{Total offer} &= \$4,000 + \$8,219.27 \\
 &= \underline{\underline{\$12,219.27}}
 \end{aligned}$$

Present worth of the second offer:



From figure 3-5, \$1.00 invested at  
4% for 6 years = \$1.265319  
(accumulation factor)

$$\begin{aligned}
 \therefore P &= \frac{\$9,100}{1.265319} \\
 &= \$7,191.87 \\
 \therefore \text{Total offer} &= \$5,000 + \$7,191.87 \\
 &= \underline{\underline{\$12,191.87}}
 \end{aligned}$$

Therefore the first offer is the better one.

## WORKOUT EXERCISE V

Draw a time line for each problem and find the present worth of the following compound amounts:

1. \$1,500 value after 5 years at 5% compounded semi-annually.
2. \$3,600 value after 6 years at 6% compounded every two months.
3. \$49.50 value after 10 years at 7% compounded semi-annually.
4. \$2,550 value after  $8\frac{1}{2}$  years at 5% compounded quarterly.
5. \$8,920.50 value after  $4\frac{2}{3}$  years at 12% compounded three times a year.
6. \$7,494.85 value after 5 years at 9% compounded monthly.
7. \$50,505.50 value after  $7\frac{1}{2}$  years at 6% compounded quarterly.
8. \$106,783.20 value after 4 years at 18% compounded monthly.
9. \$44,062.94 value after  $11\frac{1}{4}$  years at 10% compounded quarterly.
10. \$13,384.71 value after  $14\frac{1}{2}$  years at 8% compounded quarterly.

## SECTION 7 Present Worth Tables

The present worth of a future sum is found by dividing that future sum by an accumulation factor found in figure 3-5 or the tables at the end of the book. However, as you found in Workout Exercise V, dividing by numbers which have many decimal places can become quite tedious, and so tables have been compiled to do this division for us. We can restate formula (2) as:

$$P = S \times \frac{1}{\text{Accumulation factor}} \quad (3)$$

The division of the accumulation factor into one is done for us in the tables. For instance, figure 3-8 takes each accumulation factor found in figure 3-5 and divides it into one. This is a table of present values, and each value in the table is called a *discount factor*.

**Figure 3-8 A Table of Present Values**

Present Worth of \$1.00				
Period	1%	2%	3%	4%
1	0.990099	0.980392	0.970874	0.961539
2	0.980296	0.961168	0.942596	0.924556
3	0.970590	0.942322	0.915142	0.888996
4	0.960980	0.923845	0.888487	0.854804
5	0.951466	0.905731	0.862609	0.821927
6	0.942045	0.887971	0.837484	0.790315
7	0.932718	0.870560	0.813092	0.759918
8	0.923483	0.853490	0.789409	0.730690
9	0.914340	0.836755	0.766417	0.702587
10	0.905287	0.820345	0.744094	0.675564
11	0.896324	0.804263	0.722421	0.649581
12	0.887449	0.788493	0.701380	0.624597
13	0.878663	0.773033	0.680951	0.600574
14	0.869963	0.757875	0.661118	0.577475
15	0.861350	0.743015	0.641862	0.555265
16	0.852821	0.728446	0.623167	0.533908
17	0.844378	0.714163	0.605016	0.513373
18	0.836017	0.700159	0.587395	0.493628
19	0.827740	0.686431	0.570286	0.474642
20	0.819544	0.672971	0.553676	0.456387

For example, the accumulation factor for 10 periods at 3% is

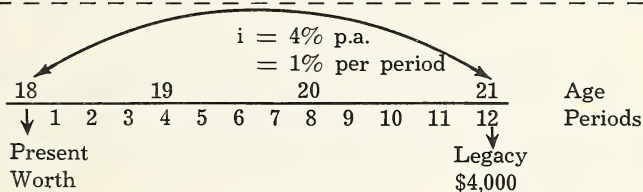
\$1.343916, from figure 3-5. The discount factor =  $\frac{1}{\$1.34396} = \$0.744094$ ; that is, the present worth of \$1.00 for 10 periods at 3%, from figure 3-8.

Because  $\frac{1}{\text{Accumulation factor}} = \text{Discount factor}$ , we can restate formula (3) as:

$$P = S \times \text{Discount factor} \quad (4)$$

We have now changed our division problem into a multiplication problem, which is much more easily performed.

*Example:* Pete Moss is to receive a legacy of \$4,000 when he is twenty-one. If money is worth 4% compounded quarterly, how much would his legacy be worth when he is eighteen assuming he could obtain it then to pay his college tuition?



Discount factor for \$1.00 at 1% for 12 periods, from figure 3-8 = 0.887449

$$\begin{aligned} \therefore \text{Present worth} &= \$4,000 \times 0.887449 \\ &= \$3,549.796 \end{aligned}$$

$$\text{Present worth of legacy} = \$3,549.80$$

## WORKOUT EXERCISE VI

Construct a time line for each problem.

1-10. Recalculate the questions in Workout Exercise V using the present value tables.

11. Construct a straight line graph from figure 3-8 showing the decrease of \$100 discounted for 20 years at 5% per annum.

12. Duncan Campbell owes the Mercury Loan Company \$5,000 payable in 5 years, and the Simon Trust Company \$7,000 payable in 3½ years. Campbell receives a legacy and decides to pay off his two debts immediately. If money is worth (that is, money can earn) 6% compounded quarterly, how much money does Campbell need to pay his debts today?



13. The Silver Dome Trading Company built a new branch at a cost of \$100,000. They can pay for it by paying \$50,000 in cash now and \$70,000 in 5 years, or by paying \$25,000 in cash now, \$35,000 in 5 years, and \$90,000 in 10 years. Which is the cheaper method, if money can be invested at 6%, compounded quarterly? By how much?

14. Sandy McLean wishes to invest, at the birth of his son Alec, a sum of money that will accumulate to \$4,500 by the time Alec is eighteen. How much must he invest if it can be accumulated at 5%, converted semi-annually?

15. Gertrude McMahon, when she died in 1950, left a certain sum of money to accumulate to \$700,000 by the year 2000. The money was left to the Canadian Rocket Research Foundation with the understanding that it could be used to aid in building a rocket anytime after 1975. In 1982 the Canadian Rocket Research Foundation were in need of funds to develop and build a new type of inter-stellar rocket and withdrew the funds. If money was then worth  $5\frac{1}{2}\%$  compounded annually, how much did they receive?

16. Casey Johnson desires to sell his summer estate and receives two offers. One is for \$3,500 cash and \$5,000 to be paid in 4 years; the other is for \$3,000 cash and \$6,500 to be paid in 5 years. If money is worth 5% compounded semi-annually, which is the better offer for Casey Johnson?

17. Mark Foster invested \$1,000 at 5% simple interest for twenty years. How much would Donald Jones have to invest at 5% compounded semi-annually to have the same amount available at the end of twenty years?

18. A reforestation of timber in Talltree County has been found to increase in value each year by  $4\frac{1}{2}\%$  of the preceding year. If its value this year is \$1,500,000, what was its value five years ago? Ten years ago? Twenty years ago? Fifty years ago?

19. Grandpa Dooley leaves each of his two granddaughters, Elizabeth and Anne, a legacy invested at 5% compounded semi-annually, so that each girl will receive \$25,000 when she is twenty-one. If Elizabeth is twelve and Anne is ten when Grandpa Dooley dies, how much did he leave to each girl?

20. Conrad Cooper has to repay a debt of \$75,000 at the end of ten years. If the rate of interest is 6% compounded quarterly for the first four years, 7% compounded semi-annually for the second four years, and 6% compounded monthly for the remainder of the time, how much would Conrad Cooper need to pay the debt back today?

21. Can you now solve the business problem at the beginning of the

chapter? Hint: Find the present worth of each offer, and then find what income Mr. Brady could earn if he invested the money and compare it with his present income. There are of course many more points to be taken into consideration before making a decision; see if you can list some.

## SECTION 8 Figuring for Fun

1. (a) Ask a friend to think of 3 numbers, (say 4, 6, and 2).
- (b) Multiply the first of them by 2, ( $2 \times 4 = 8$ ).
- (c) Add 3, ( $8 + 3 = 11$ ).
- (d) Multiply by 5 and add 7, ( $11 \times 5 = 55 + 7 = 62$ ).
- (e) Add in the second number, ( $62 + 6 = 68$ ).
- (f) Multiply by 2, and add 3, ( $68 \times 2 = 136 + 3 = 139$ ).
- (g) Multiply by 5 and add in the third number, ( $139 \times 5 = 695 + 2 = 697$ ).
- (h) Ask for the result, then deduct 235, ( $697 - 235 = 462$ ).

The three numbers thought of were 4, 6, and 2, in the order in which they were introduced into the problem.

2. To send messages in code: A secret code is very simple to construct and quite difficult for other people to solve. For instance, instead of using the letters of the alphabet, use figures. The figures can be in a straight sequence or in any other order you wish; for example:

A	B	C	D	E	F	G	H	I	J	K	L	M
1	3	5	7	9	11	13	15	17	19	21	23	25
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
27	29	31	33	35	37	39	41	43	45	47	49	51

Now substitute the assigned figure for the required letter

$$13 - 29 - 29 - 7 \qquad 23 - 41 - 5 - 21$$

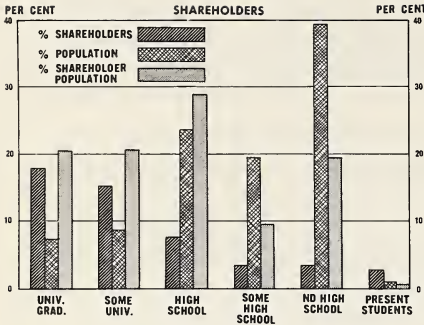
Another easy one is:

A	B	C	D	E	F	G	H	I	J	K	L	M
z	y	x	w	v	u	t	s	r	q	p	o	n
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
m	1	k	j	i	h	g	f	e	d	c	b	a

Make up your own code.

# Investing in Stocks and Bonds

## 4



### A Business Problem

Albert Arden wishes to invest \$5,000 in the Champion Cab Company. The company have issued the following shares: 12,000 common shares; 5,000 5½%, \$100 par, cumulative preference shares; 5,000 6%, \$50 par, noncumulative preference shares.

Before deciding which shares to buy, Mr. Arden investigates the dividend record for the last six years and finds the following dividends have been distributed to shareholders: \$72,500; \$20,000; \$100,000; \$81,000; \$37,000; \$75,000.

If Mr. Arden is interested in obtaining the highest annual yield rate on his investment, and the three classes of shares are currently priced at \$41.00, \$98.00, and \$51.00, respectively; which class of shares should Mr. Arden purchase?

## SECTION 1 Stocks

To invest money in stocks is relatively simple to accomplish. Millions of people in all walks of life set aside sufficient extra cash to become investors. It is estimated that about 75% of these investors have incomes of less than \$7,500 and about 35% earn less than \$5,000 a year. Stock ownership is divided almost equally between men and women of every age. Everyone in Canada who can afford to invest\* should own a share in Canadian business and hence in Canada's future. This, in a very few years, may well include you.

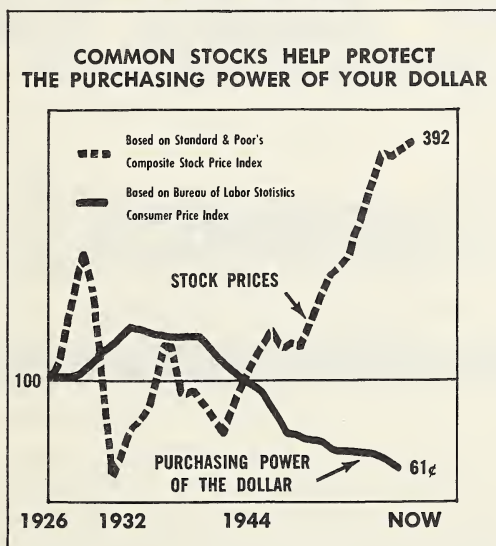
But why should you invest your money in stocks? In the first place, this is the best way to make the purchasing power of your money keep pace with the growing economy and the inflation that has been taking place over the last few centuries, and more particularly in the last few decades, and which will probably continue into the foreseeable future. For example, if a person had invested \$100 twenty years ago at 3½% per annum, interest compounded

\* You can afford to invest if you have cash left over after paying living expenses and providing protective insurance, and if you have a cash reserve to meet emergencies.



quarterly, it would today be worth \$200. But the \$200 today would not buy as much for the person as the \$100 would have bought twenty years ago; so this investment has resulted in a decrease instead of an increase in purchasing power over the years. On the other hand, values of good common stocks have increased approximately 6% per annum over the last twenty years and, in addition, have probably paid a number of dividends to their owners. Our \$100 investment in this case would now be worth approximately \$460, exclusive of any dividends paid on this stock during the twenty years. This is indicated in figure 4-1.

**Figure 4-1      Comparison of the Purchasing Power of the Dollar and Common Stock Prices**



A second reason for buying stocks is because the stock of a company represents the ownership of that company. If you own one share of stock in the ABC Company, and the ABC Company has issued one hundred shares, then you own one-hundredth part of the ABC Company. If the ABC Company makes a profit, then part of this profit will probably be paid out to you in the form of dividends, and you will receive one-hundredth part of the dividends that are distributed. The remainder of the profit will go back into the business and increase its value and, consequently, the value of your one per cent ownership.

A third reason for investing your money in stocks is in order to have a share in developing Canada's future. The capital put up by investors has helped to develop many of our present large corporations and our natural resources; it has helped to finance large and expensive projects such as the cross-country pipelines.

When you invest your money by purchasing shares of stock, you become a *shareholder* in the company and will receive a *share certificate* similar to the one reproduced in figure 4-2.

Figure 4-2

## A Share Certificate



Courtesy of Atlantic Sugar Refineries Co., Limited

There are two kinds of shares, preferred shares and common shares. *Preferred shares* usually entitle the owner to a specified percentage of dividend if the profits made during the year are sufficiently high to warrant paying this dividend. In any year that dividends are paid, the preferred shareholders must receive their specified percentage before any dividends can be paid to the common shareholders. Preferred shareholders are not usually entitled to a vote at the company meetings except when their dividends are in arrears. *Common shares* are the common shares of the company and do not carry any specified rate of dividend. No dividends can be paid on common shares until all dividends have been paid on the preferred shares. If the profit of the company is very low, the common shareholders may not receive any dividend; but if the company prospers, the common shareholders may receive a larger dividend than the preferred shareholders. The common shareholders have the right to vote at the

company meetings and elect the directors of the company.

*Capital stock:* When a company first starts in business, it will have to decide how much money will be needed to obtain the necessary buildings, machinery, tools, merchandise and people to conduct the business. It will then become incorporated under the Companies Act (Canada) or one of the Provincial Companies Acts and be allowed to offer for sale an authorized amount of capital stock in order to raise the money it needs.

*Par value:* Assume, for example, that a company is authorized to issue \$50,000 of capital stock; it may decide to issue 5,000 share certificates and place a value on each certificate of \$10. This is the par value of the certificate. If the company is successful, the price of these shares will increase as time goes by, and the purchase price will no longer equal the par value. The dividends of preferred shares are normally quoted on the par value.

*No par value:* As few shares will ever again be worth exactly par value after their initial sale by the company, it has become customary in recent years to issue common stock with no par value placed on the certificate.

### WORKOUT EXERCISE I

1. The Beaverbrook Company Limited incorporated twenty years ago and issued 1,000 8% preferred shares, par value \$100; and 5,000 common shares, par value \$10. What is the value of their capital? If you own 10 preferred shares and 500 common shares, what per cent of the company do you own?
2. If the value of the preferred shares in problem 1 is now \$175 per share and the value of the common shares is \$42 per share, what is the value of your investment today? What per cent increase is this over the value of the investment twenty years ago?
3. If you had deposited twenty years ago the same amount of money as you invested in problem 1 in a bank account earning 4%, compounded quarterly, what would your investment be worth today? What per cent greater is the value of the investment today (problem 2) than the bank account balance today?
4. Brady Dog Foods Limited incorporated ten years ago and issued 15,000 7% preferred shares, \$10.00 par value; and 70,000 no par value common shares which sold for \$1.00 a share. What is the value of their issued capital? If Sam Mullins purchases 75 preferred shares and 1,000 common shares, what per cent of the company does he own?
5. If the preferred shares of Brady Dog Foods Limited are today

valued at \$16.00 and the common shares at \$9.50, what is the present value of Sam Mullins' investment? What per cent increase is this over the value of investment ten years ago?

6. Ten years ago, Paul Roach deposited in a trust bank paying  $4\frac{1}{2}\%$  per annum an equal amount as Sam Mullins invested in the shares of Brady Dog Foods Limited. How much is now in Roach's bank account? What per cent greater is the investment of Mullins than the investment of Roach?

## SECTION 2 Calculation of Dividends

In any year of operation, most companies will pay out in dividends to their shareholders part of any profit they have made. The directors of the company, who were elected by the common shareholders, decide how much dividend will be paid and when. Most established companies try to pay dividends at a regular annual rate, payable yearly, half-yearly, or quarterly. The dividend payments are made by cheque and mailed to the shareholders.

### Dividend Based On the Par Value of the Share

The dividend payable on a preferred share is stated in advance as a percentage of the par value and is printed on the share certificate. Thus the holder of a 5% preferred share with a par value of \$100 is entitled to a yearly dividend of \$5.00, if sufficient profit is made.

### Dividend Based On a Per Share Basis

The dividend on a no par value common share is paid at a declared amount per share.

*Example:* The Sloan Company Limited, after declaring the dividend on their 7% preferred shares, declare a dividend of 50¢ a quarter per common share. Tom Defoe owns 125 common shares and 25 7%, \$100 par value, preferred shares. What will be the amount of his quarterly cheque?

125 common shares earn \$ .50 per quarter = \$62.50

25 \$100 preferred shares earn

$\frac{7}{4} \times \frac{25}{1}$  per quarter = \$43.75

∴ Tom Defoe's quarterly cheque will amount to \$106.25



**Annual Yield On an Investment**

The rate of return on an investment is called the *yield* and is found by dividing the annual dividend by the total cost of the investment.

$$\text{Annual yield} = \frac{\text{Annual dividend}}{\text{Cost of investment}} \quad (1)$$

*Example:* If the preferred shares of the Sloan Company Limited cost \$125 and the common shares cost \$32, what is the annual yield that Tom Defoe earns on his investment?

Tom Defoe:

125 common shares at \$32 per share	=	\$4,000
25 preferred shares at \$125	=	<u>3,125</u>
Investment cost	=	<u>\$7,125</u>
Dividend (previous example) \$106.25 $\times$ 4	=	\$ 425
$\therefore$ Yield = $\frac{425}{7125}$	=	0.0596 = 6.0%

**Total Dividend Payments By the Company**

*Example:* The Sloan Company Limited sold preferred shares with a total par value of \$1,500,000 and 125,000 common shares.  
 (a) How much per quarter would they pay out in dividends on the 7% preferred shares plus \$2.00 a year per common share? (b) If they distribute as dividends 75% of their annual profit, how much annual profit must they make before they can pay the desired dividend?

(a) Payment per quarter:

On common shares

$$125,000 \times \$ .50 = \$62,500$$

On preferred shares

$$\frac{\$1,500,000}{1} \times \frac{7}{100} \times \frac{1}{4} = \underline{26,250}$$

Total payment per quarter \$88,750

(b) Desired quarterly payment \$88,750

$\therefore$  Yearly profit requirement \$355,000

$\therefore$  75% of annual profit \$355,000

∴ 100% of annual profit

$$\frac{\$355,000}{1} \times \frac{100}{75} \qquad \$473,333$$

The company must therefore make a profit of \$473,333 a year in order to pay the desired dividends and retain 25% of the profits.

*Example:* In the following year, the directors of the Sloan Company Limited declare a total dividend of \$255,000 for the year, payable \$63,750 per quarter. How should the quarterly dividend distribution be made per common share and per preferred share?

Preferred shares:	=	\$26,250
Payment per quarter	=	\$1.75 per share
Common shares:		
Amount available	=	\$63,750 - 26,250
	=	\$37,500
Payment per quarter	=	\$ .30 per share

## WORKOUT EXERCISE II

Calculate the yield, to one decimal place, on the following investments. Estimate your answers and use Austrian division.

<i>Investment</i>	<i>Income</i>	<i>Investment</i>	<i>Income</i>
1. \$5,000	\$490	6. \$1,020,790	\$81,000
2. \$9,476	\$510	7. \$150.50	\$7.50
3. \$1,248	\$75	8. \$3,029.80	\$410.70
4. \$7,840.75	\$486.50	9. \$482.20	\$41.30
5. \$10,429.50	\$796.20	10. \$78,921.15	\$5,431.10

11. If you receive \$2.00 a year dividend per common share in addition to the preferred dividend on your investment in the Beaverbrook Company Limited (problem 1, Workout Exercise I), what is your income from this investment? What annual yield does your investment bring at today's value? (Problem 2, Workout Exercise I)

12. Sam Mullins (problem 4, Workout Exercise I) received a dividend of 50¢ per common share in addition to the preferred dividend on his investment in the Brady Dog Foods Limited. What was the amount of the total income from his investment? What was the annual yield on his investment at today's value?

13. Broderick Brady owns the following stocks:

500 8% \$100 par preferred shares of Beaverbrook Company Limited at \$175 a share;

2,000 common shares of Beaverbrook Company Limited at \$42.00 a share, dividend \$2.00 a year;

1,600 7% \$10 par preferred shares of Brady Dog Foods Limited at \$16.00 a share;

1,500 common shares of Brady Dog Foods Limited at \$9.50 a share, dividend 50¢ a year;

500 7% \$100 par preferred shares of Sloan Company Limited at \$125 a share;

1,000 common shares of Sloan Company Limited at \$27.00 a share, dividend 50¢ a quarter.

What is the value of his total investment? What is his annual yield?

How much would the following companies pay out per quarter in dividends under the following conditions?

Name	Preferred stock issued	Common stock issued	Common dividend paid per annum
14. A & B Co. Ltd.	1,000 6%, \$100 par	2,000	\$1.20
15. C & D Co. Ltd.	2,500 6½%, \$ 50 par	10,000	\$2.00
16. F & G Co. Ltd.	300,000 7%, \$150 par	100,000	\$3.60
17. J & K Co. Ltd.	10,000 5%, \$100 par	50,000	\$2.20
18. L & M Co. Ltd.	7,500 4%, \$125 par	1,000,000	\$1.60
19. E.N.O. Co. Ltd.	5,000 4½%, \$100 par	100,000	\$3.20

20. The A & B Co. Ltd. distributed 80% of their annual profit. What was their annual profit if they paid the dividends indicated in problem 14?

21. The C & D Co. Ltd. distributed 65% of their annual profits as dividends. What was their annual profit if they distributed the dividends indicated in problem 15?

22. The P & Q Co. Ltd. has 4,000 shares of common stock and 2,000 shares of 5%, \$100 par value, preferred stock. The directors have declared a total dividend of \$20,000. How should it be distributed among the common and preferred shareholders?

23. The directors of S & T Co. Ltd. vote a total dividend payment of \$45,000. If 2,500 common shares and 10,000 6%, \$50 par, preferred shares are issued, what dividend will be paid per share on each type of share?



24. A total dividend of \$35,000 has been declared by the Directors of U & V Co. Ltd. How much per share will each type of shareholder receive if there are 10,000 common shares and 3,500 5%, \$100 par, preferred shares issued?

25. The X & Y Co. Ltd. have issued 10,000 common shares on which they wish to pay a quarterly dividend of 60¢ a share. If they have also issued 10,000 6%, \$50 par, preferred shares, how much profit must they make in a year in order to pay the desired dividends to the common shareholders?

### SECTION 3 Newspaper Quotations

If you decide to buy some stock, how do you find out what it will cost you? The price of stock, like the price of any commodity, depends upon how much the buyers are willing to pay and for how little the sellers are willing to sell. Once the stock has been sold initially by the company to the public, it is bought and sold or "*traded*" on the open market at whatever price both the buyer and seller agree upon. This price is influenced by such things as how much profit the company has made in the past and how much it can be expected to make in the future; the present and future prospects of the whole industry of which this company forms a part; and the present condition of all business.

If a company's shares are traded on a stock exchange, the prices are listed on the financial pages of the daily newspapers and in the weekly financial papers. They are not nearly so formidable as they at first appear. The record for the Sloan Company Limited would be found listed alphabetically among the other stocks, and on a given day might look like this:

**Figure 4-3 A Stock Price Quotation**

Stock	Div. \$	Sales	High	Low	Close	Net Change
Sloan	2	9071	41 $\frac{7}{8}$	40	40 $\frac{7}{8}$	- $\frac{7}{8}$

Reading this record from left to right, we note that the Sloan Company Limited is currently paying an annual dividend of \$2.00 on each share, and that 9,071 shares of stock were sold during this particular day. The highest price paid for a share of stock during the day was \$41 $\frac{7}{8}$  and the lowest price paid was \$40.00. The last sale of the day was at \$40 $\frac{7}{8}$ . This last sale was  $\frac{7}{8}$  lower than the last sale of the previous day.

In addition, the weekly quotations usually give the high and low prices for the current year and/or the high and low prices for the previous year. Figure 4-4 shows a section of a weekly report of the Montreal, Toronto, Winnipeg, Calgary, and Vancouver exchanges. You will note that fractional parts of \$1.00 are quoted in eighths, quarters, or halves; these are the fractional parts of a dollar in which shares are usually traded. However, if the shares cost under \$10.00 a share, they are frequently quoted in dollars and cents.

Figure 4-4

## A Newspaper Quotation

INDUSTRIAL STOCKS										
Week Ending October 13, 19-4										
Range 19-4		Div. Y'd R'te Oct.13		Company	Sales	Last Oct. 6	Week end Oct. 13		Close or Latest	
High	Low	\$	%				High	Low		
A										
43 $\frac{3}{8}$	36 $\frac{5}{8}$	1.70	4.3	Abitibi .....	10684	39	39 $\frac{5}{8}$	38 $\frac{1}{2}$	39 $\frac{1}{4}$	
25 $\frac{1}{2}$	23 $\frac{3}{8}$	1.12 $\frac{1}{2}$	4.5	Do. 4 $\frac{1}{2}$ % pref.	1092	25	25	24 $\frac{3}{4}$	24 $\frac{3}{4}$	
27 $\frac{1}{2}$	19	.72	3.1	Agnew Surp. ...	5	23	23	23	23	
1.75	1.00	..	..	Alaska Y. Pipe ..	nil	..	..	A1.00	1.00	
49 $\frac{1}{8}$	32 $\frac{1}{2}$	1.20	2.5	Algoma Steel ..	19817	47 $\frac{3}{4}$	49 $\frac{1}{8}$	47 $\frac{1}{2}$	49	
38 $\frac{1}{8}$	27 $\frac{1}{4}$	▲.60+	*.10	Aluminium ....	30090	28 $\frac{1}{8}$	28 $\frac{1}{2}$	27 $\frac{3}{8}$	27 $\frac{7}{8}$	
35	25 $\frac{1}{4}$	1.20+	▲.20	Asbestos .....	4725	34 $\frac{3}{4}$	34 $\frac{3}{4}$	33	33 $\frac{3}{4}$	
12 $\frac{1}{4}$	7 $\frac{1}{4}$	.40	3.5	Avalon Tele. ...	3225	11	11 $\frac{1}{2}$	11	11 $\frac{1}{2}$	
B										
70 $\frac{3}{4}$	59 $\frac{1}{8}$	1.80+	▲.25	Bk. Montreal ..	10555	68 $\frac{1}{8}$	70 $\frac{1}{4}$	68 $\frac{1}{8}$	69 $\frac{3}{4}$	
80 $\frac{1}{2}$	66 $\frac{3}{4}$	2.20+	▲.10	Bk. N. Scotia ..	3352	75 $\frac{3}{4}$	76	75 $\frac{1}{2}$	75 $\frac{3}{4}$	
8 $\frac{3}{4}$	8 $\frac{1}{4}$	NEW	..	Beatty Bros. ...	1400	..	8 $\frac{3}{4}$	8 $\frac{1}{4}$	8 $\frac{1}{2}$	
27	21	1.00+	▲.25	Beaver Lumber ..	595	26 $\frac{1}{2}$	26 $\frac{1}{2}$	26 $\frac{1}{4}$	26 $\frac{1}{2}$	
20 $\frac{1}{4}$	18 $\frac{7}{8}$	1.00	5.0	Do A .....	123	†21	20 $\frac{1}{8}$	20 $\frac{1}{8}$	20 $\frac{1}{8}$	
28	27	1.40	5.0	Do Pref. ....	nil	..	B28	..	28	
56 $\frac{1}{2}$	47 $\frac{3}{8}$	2.20	3.9	Bell Telephone ..	25116	55 $\frac{7}{8}$	56 $\frac{1}{2}$	55 $\frac{5}{8}$	56 $\frac{3}{8}$	
35	30	1.00+	▲.50	Bowes Co. ....	130	33	33	31	33	
5.75	3.70	\$.25	..	Brazilian Tr. ...	16222	3.85	3.85	3.70	3.85	
80	72	6.00	8.0	Do. pref. ....	nil	..	B80 $\frac{1}{8}$	A1.00	75 $\frac{1}{8}$	
C										
1.60	1.45	..	..	Cantexas A ....	nil	..	B1.45	A1.65	1.60	
16 $\frac{1}{4}$	12 $\frac{1}{2}$	..	..	Cockshutt Farm. ..	241	13	12 $\frac{5}{8}$	12 $\frac{1}{2}$	12 $\frac{5}{8}$	
21	16	.40	1.9	Consumers Gas ..	28625	20 $\frac{1}{4}$	21	20 $\frac{1}{4}$	21	
109	105	5.50	5.1	Do A 5 $\frac{1}{2}$ % pr. ..	nil	..	B109	..	108 $\frac{3}{4}$	
109	104	5.50	5.1	Do B 5 $\frac{1}{2}$ % pr. ..	85	106	107 $\frac{5}{8}$	107 $\frac{1}{2}$	107 $\frac{1}{2}$	
8 $\frac{7}{8}$	6 $\frac{7}{8}$	.40+	▲.10	Copp Clark ....	225	8 $\frac{1}{4}$	8 $\frac{1}{2}$	8 $\frac{1}{4}$	8 $\frac{1}{4}$	
47 $\frac{1}{2}$	33 $\frac{7}{8}$	1.00	2.2	Crown Trust ....	nil	..	B44 $\frac{1}{2}$	A44 $\frac{1}{2}$	44 $\frac{1}{2}$	
10 $\frac{1}{4}$	5 $\frac{3}{4}$	.20	2.9	Crush Int. ....	470	7	7	6 $\frac{1}{4}$	7	
109	97 $\frac{3}{4}$	6.50	6.1	Do 6 $\frac{1}{2}$ % pf A ..	45	106	106	106	106	
D										
86 $\frac{1}{2}$	84	7.00	8.4	Dalex Co. pref. ..	40	84	†83	†82	†83	
..	..	..	..	De Havilland A ..	nil	..	B200	A250	..	
45 $\frac{1}{2}$	31 $\frac{3}{4}$	1.20+	▲.50	Distill-Seagram ..	28891	44	45 $\frac{1}{2}$	43 $\frac{3}{4}$	45 $\frac{1}{2}$	
68	45	1.40	2.1	Dom. Fdry. ....	6738	64 $\frac{7}{8}$	68	64 $\frac{3}{4}$	67 $\frac{1}{2}$	
102	99	4.50	4.4	Do 4 $\frac{1}{2}$ % pf. ...	35	101 $\frac{1}{4}$	101 $\frac{1}{2}$	101 $\frac{3}{8}$	101 $\frac{3}{8}$	
83	66	2.20+	▲.60	Dom. Glass ....	1085	80	82	80 $\frac{7}{8}$	82	
15 $\frac{1}{2}$	13 $\frac{1}{2}$	.70	4.9	Do pref. ....	nil	..	B14	B19 $\frac{1}{2}$	14 $\frac{1}{4}$	
17 $\frac{5}{8}$	14 $\frac{5}{8}$	.32	2.1	Dom. Stores ....	25067	14 $\frac{7}{8}$	15 $\frac{3}{4}$	14 $\frac{7}{8}$	15 $\frac{1}{2}$	
27 $\frac{1}{2}$	19 $\frac{1}{8}$	.50	1.9	Du Pont of Can. ..	2289	26 $\frac{1}{4}$	26 $\frac{1}{4}$	26	26	

*Example:* From figure 4-4 find the cost of 150 shares of Consumers Gas, assuming you were lucky enough to purchase them at the low for the day, and 125 shares of Bank of Montreal, assuming you obtained them at the closing price.

Consumers Gas, low for day,  $20\frac{1}{4}$

Cost 150 shares =  $150 \times \$20.25 = \$3,037.50$

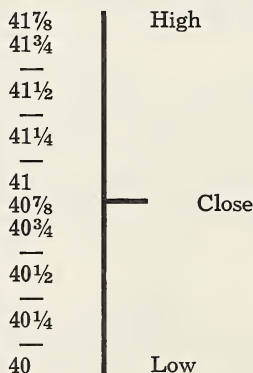
Bank of Montreal, closing,  $69\frac{3}{4}$

Cost of 125 shares =  $125 \times \$69.75 = 8,718.75$   
\$11,756.25

### Graphical Presentation of Stock Quotations

The high and low prices for the day are usually portrayed by a vertical bar joining the high and low points. The closing quotation is represented by a small vertical bar as in figure 4-5.

**Figure 4-5**      **A Graphical Presentation of the Price  
Of the Sloan Stock**

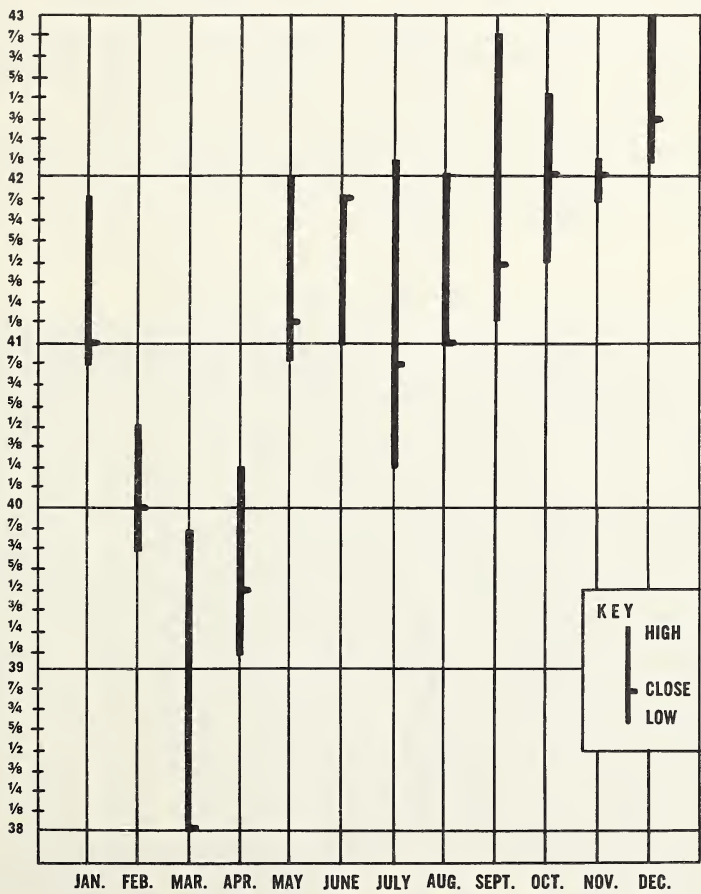


*Example:* Record graphically the prices of the stock of the Sloan Company Limited for the last twelve months, given the following information.

	High	Low	Close
January	$41\frac{7}{8}$	$40\frac{7}{8}$	41
February	$40\frac{1}{2}$	$39\frac{3}{4}$	40
March	$39\frac{7}{8}$	38	38
April	$40\frac{1}{4}$	$39\frac{1}{8}$	$39\frac{1}{2}$
May	42	$40\frac{7}{8}$	$41\frac{1}{8}$

June	41 <sup>7</sup> / <sub>8</sub>	41	41 <sup>7</sup> / <sub>8</sub>
July	42 <sup>1</sup> / <sub>8</sub>	40 <sup>1</sup> / <sub>4</sub>	40 <sup>7</sup> / <sub>8</sub>
August	42	41	41
September	42 <sup>7</sup> / <sub>8</sub>	41 <sup>1</sup> / <sub>8</sub>	41 <sup>1</sup> / <sub>2</sub>
October	42 <sup>1</sup> / <sub>2</sub>	41 <sup>1</sup> / <sub>2</sub>	42
November	42 <sup>1</sup> / <sub>8</sub>	41 <sup>7</sup> / <sub>8</sub>	42
December	43	42 <sup>1</sup> / <sub>8</sub>	42 <sup>3</sup> / <sub>8</sub>
See figure 4-6.			

Figure 4-6 Sloan Company Limited  
Market Price of Stock For the Year 19-1



Source: Hometown Financial News

**WORKOUT EXERCISE III**

1. Using figure 4-4, record the high, low and closing prices of the following stocks: Beatty Bros., Dominion Foundry, Brazilian Traction, Cockshutt Farm, Agnew Surpass, Abitibi P & P, Copp Clark, Avalon Tele, Bell Telephone, Dominion Glass, Asbestos, Beaver Lumber.

Look up the prices of these stocks in today's newspaper. If you had purchased ten shares of each company's stock on the day of the first quotation, how much would you have made or lost on each ten shares? On the total investment? Use the closing price for your calculations.

2. Select ten preferred stocks and ten common stocks from the financial section of the newspaper. List them alphabetically. Record the day-to-day fluctuations for the period of one week.

3. Choose one preferred stock and one common stock from the ten already selected or from the newspaper. Record the high, low and closing prices of each for one week, and prepare a graph for each stock to record this information.

**SECTION 4      The Canadian Stock Exchanges****A Brief History**

The Montreal and Toronto Stock Exchanges opened their doors during the 1830's but traded only in a few selected securities until about 1900. After 1900 population increased, the west opened up, and expansion was rapid. Mining stocks were first traded about the turn of the century. Between 1900 and the First World War exchanges opened at Winnipeg, Vancouver and Calgary.

The number of shares traded on all the exchanges has continued to increase to the present day, except for a depression period from 1929 until the commencement of the Second World War. This depression was preceded in 1929 by a "crash" of the stock market which sent unprecedentedly high stock values plummeting downward and, within a few days, financially ruined many individuals and companies.

There are now two hundred stock exchanges in the world, of which twenty-three are located in North America. Canada has seven, and the Toronto Stock Exchange is largest of the seven and accounts for eighty per cent of the Canadian trade. On this continent, it is second only to the New York Stock Exchange, and in some years the number of shares traded on it has exceeded the number traded on the N. Y. S. E. (by over one hundred per cent in 1956!).

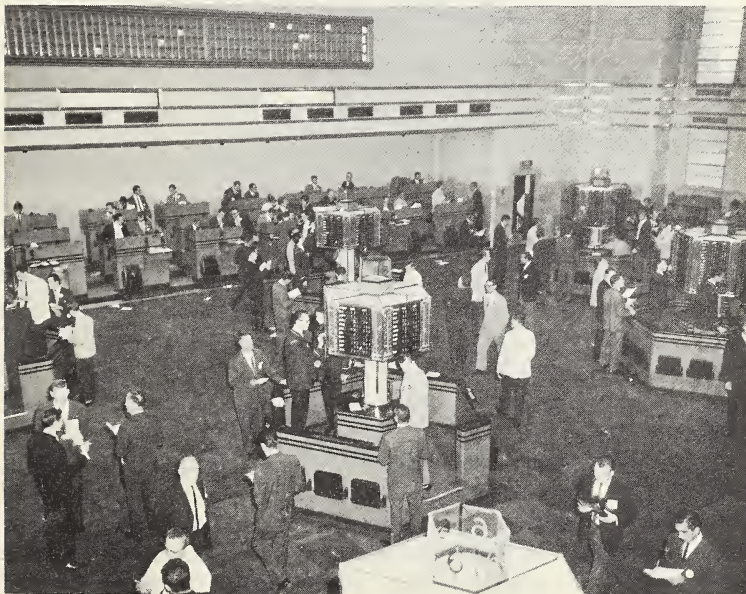


However, many of the stocks traded on the Toronto Stock Exchange are of low value and include mining and other speculative shares; hence our dollar value is less than ten per cent of the value of the trade on the New York Stock Exchange. Nevertheless, the Toronto Stock Exchange is one of the best equipped exchanges in the world and can handle a volume exceeding twelve million shares a day.

### To Trade On an Exchange

The "trading" of stocks started under a buttonwood tree on New York's famous Wall Street. Twenty-four merchants formed an agreement that they would deal only with each other and charge their customers a fixed commission. These "traders" were the first "members" of the New York Stock Exchange. A membership in an exchange is known as a *seat* on the exchange and can only be held by an individual, not a company. It is still necessary to own a seat on any exchange to be able to trade stocks on that exchange. Seats on all the exchanges are bought and sold, and a seat today on a large exchange might cost in excess of one hundred thousand dollars. Exchanges do not buy, sell, or own stock; they are merely market places where traders in stocks meet and buy and sell stock among themselves for the benefit of their customers.

**Figure 4-7      The Floor of the Toronto Stock Exchange**



*Courtesy of the Toronto Stock Exchange*

## To List a Stock On an Exchange

Before a company's stock is admitted to the list of stocks traded on any exchange, it must meet the minimum requirements set down by the members of that exchange as to its financial position, amount of capital, number of shareholders, or other stipulated regulations.

## WORKOUT EXERCISE IV

### Project:

If you are situated near a stock exchange, organize a class visit to the exchange. Write an essay and design a class bulletin board.

If you are not situated near a stock exchange, write to several Canadian and American exchanges for literature. Write an essay and design a class bulletin board.

An excellent movie is available showing the New York Stock Exchange from its early beginnings on old Wall Street, and could be shown before writing the essay.

## SECTION 5     Placing an Order For Stock

If you decide to purchase some stock, you must first select a reputable broker. The brokerage office will then assign you to an "account executive" or a "customer's man", and he will discuss your investment requirements with you, help you to open an account, transact all your business for you, and keep you informed concerning the market trends. After opening your account and meeting your account executive, you can in future transact business by telephone, letter, or in person.

Let us assume that you wish to buy 100 shares of Sloan Company Limited and telephone Mr. Cowan, your account executive, for a quotation. He gives you the quotation "\$41 to a quarter". This means that, at the present moment, the highest bid to buy Sloan Co. is \$41 a share, and the lowest offer to sell is \$41.25. This is the "*bid and ask*" quotation as of that moment.

Mr. Cowan may read the price from the "quote board" in the broker's office on which each change of price is recorded as it comes through from the floor of the exchange on the ticker tape, or he may contact the floor of the exchange directly.

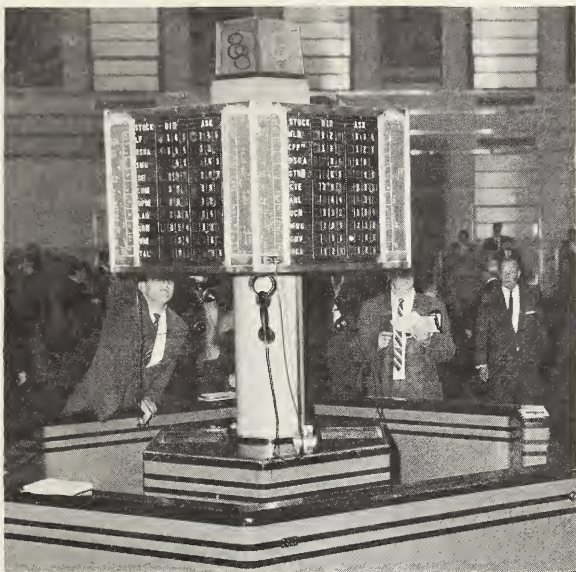
Suppose you place an order, to be executed immediately, for the 100 shares. (You can specify whether you wish to purchase immediately at the best price obtainable or prefer to place a *limit order* to purchase only if the stock is available at, say, \$39 $\frac{7}{8}$ .)



Figure 4-8

## A Trading Post

*One of the eleven trading posts on the trading floor of the Toronto Stock Exchange. Here the latest offers to buy and sell are listed for specific groups of stock.*



*Courtesy of the Toronto Stock Exchange*

If your broker is not located in the same city as the exchange trading in the stock you wish to purchase, your order will be teletyped to the broker's office in that city. The order is then relayed to the broker's telephone booth on the floor of the exchange.

The firm's floor broker goes to the trading post where this stock is being bought and sold, and bargains for it to obtain it at the best possible price. Assume someone else had decided to sell 100 shares of Sloan Co.; the order to sell would have been relayed to the floor of the exchange in the same way as your order to buy, and this person's floor broker would go to the same trading post.

Assume also that a bid has already been made to buy 100 shares at \$41 a share, but no one is willing to sell at this price; therefore your broker will raise the offer to \$41 $\frac{1}{8}$ . The broker representing the person selling the shares has found no one willing to buy the shares he is offering at \$41 $\frac{1}{4}$  a share; so he will try to sell the 100 shares at \$41 $\frac{1}{8}$ . When he hears your broker bid \$41 $\frac{1}{8}$ , he shouts, "Sold 100 at \$41 $\frac{1}{8}$ ."

The transaction is now completed, and a report is telephoned from

the exchange booth to the broker's office and then relayed to you. The whole transaction has probably taken only a few minutes.

You are notified through the mail of the cost of your shares, and the amount is charged to your account. After you have paid for your shares, the certificate will be sent to you or to your broker.

### The Size of an Order

Shares are sold in "*board lots*" which are designated as follows:

Price per share, \$100 or over; board lot is 10 shares.

Price per share, \$25-100; board lot is 25 shares.

Price per share, \$1-25; board lot is 100 shares.

Price per share, under \$1; board lot is 500 shares.

If you wish to purchase less than a board lot, you will probably have to pay an extra cost per share, and the transaction may take a little longer to complete. On industrials this will amount to  $\frac{1}{8}$  to  $\frac{1}{2}$  a point per share, while on oil and mining shares it will be a few cents a share on the penny stocks (i.e., those selling for under \$1.00) and as much as 10 cents or 15 cents a share on shares selling for over \$1.00.

### WORKOUT EXERCISE V

Questions for Class Discussion:

1. What is the first step to take if you wish to invest some money in stock? Why?
2. In what ways does your account executive serve you?
3. What does the quotation "\$94 to an eighth" mean?
4. From where does your account executive obtain the quotation he gives you?
5. What procedure is followed to place your order if you live elsewhere than in the city in which the exchange is located?
6. What is meant by a "board" lot?
7. Describe the trading of a board lot of stock on an exchange.

## SECTION 6 Brokerage

How much will the broker charge for all the service he gives you? The members of the stock exchanges have agreed to charge a standard scale of rates on all the orders they execute. The rates vary with the price of the order and are a little higher on small orders

than on large orders. From figure 4-9 we see that the commission charged on 100 shares of Sloan Co. purchased at \$41 $\frac{1}{8}$  a share would be \$40.

**Figure 4-9 Authorized Commission Rates**

Selling			COMMISSION		
Under	\$ .05 a share		\$ 1.50	per thousand shares	
At	.05 and under	\$ .10	3.00	" "	"
"	.10 "	" .25	5.00	" "	"
"	.25 "	" .50	7.50	" "	"
"	.50 "	" .75	10.00	" "	"
"	.75 "	" 1.00	15.00	" "	"
"	1.00 "	" 2.00	2.50	per hundred shares	
"	2.00 "	" 3.00	4.50	" "	"
"	3.00 "	" 4.00	7.00	" "	"
"	4.00 "	" 5.00	10.00	" "	"
"	5.00 "	" 7.50	15.00	" "	"
"	7.50 "	" 10.00	20.00	" "	"
"	10.00 "	" 15.00	25.00	" "	"
"	15.00 "	" 25.00	30.00	" "	"
"	25.00 "	" 40.00	35.00	" "	"
"	40.00 "	" 60.00	40.00	" "	"
"	60.00 "	" 80.00	45.00	" "	"
"	80.00 "	" 100.00	50.00	" "	"
"	100.00 "	" 110.00	55.00	" "	"
"	110.00 "	" 120.00	60.00	" "	"
"	120.00 and over,	$\frac{1}{2}$ of 1% of selling price.			
MINIMUM CHARGE ON EACH TRANSACTION:					
Total shares costing \$10-50			\$2.00		
Total shares costing over \$50			\$5.00		

The broker will charge authorized commission on the purchase or on the sale of shares. In addition, the provinces of Ontario and Quebec charge a stock transfer tax on transactions within each province as shown in figure 4-10. This tax is paid by the seller of the stock only. No transfer tax has been charged by the Federal Government since 1953.

**Figure 4-10 Stock Transfer Taxes**

ON SHARES SELLING:	
Under \$1 .....	$\frac{1}{10}$ of 1% of selling price
From \$1 to \$5 .....	$\frac{1}{4}\text{¢}$ per share
Over \$5 to and including \$25 .....	1¢ per share
Over \$25 to and including \$50 .....	2¢ per share
Over \$50 to and including \$75 .....	3¢ per share
Over \$75 to and including \$150 .....	4¢ per share
Over \$150 .....	4¢ per share plus $\frac{1}{10}$ of 1% of the value of the said share in excess of \$150

*Example:* Sally Hopper of Sunville, Ontario, requested her broker to purchase for her 500 shares of Opportunity Mines quoted at 27¢ a share and to sell 200 shares of Blue Elixir Oils quoted at \$14½ a share. How much brokerage commission and transfer tax would Sally Hopper have to pay?

-----  
 Brokerage:

Purchase of Opportunity Mines

$$500 \text{ shares at } 27¢ \text{ a share} = \frac{\$7.50}{2} = \$ 3.75$$

Sale of Blue Elixir Oils

$$200 \text{ shares at } \$14\frac{1}{2} \text{ a share} = 2 \times \$25 = \underline{50.00}$$

$$\text{Brokerage commission} \quad \quad \quad \$53.75$$

Transfer tax:

$$\text{Sale of Blue Elixir Oils} = 200 \times 1¢ = \underline{2.00}$$

Total brokerage commission and  
transfer tax

$$\underline{\underline{\$55.75}}$$

## WORKOUT EXERCISE VI

Calculate the brokerage commission on the following orders:

	<i>Number of Shares</i>	<i>Name of Stock</i>	<i>Price Per Share</i>
1. Buy:	10	Bell Trailer	\$45.00
	100	Consolidated Oil	17½
	1,000	Noster Oil Ltd.	.19
Sell:	50	Allistair Brewers	37.00
	800	Provincial Copper	3½
	50	Eldridge Mines	20.00
2. Buy:	300	Spica Gold	7½
	15	Virgo Silver	110¼
	3,000	Pisces Lead	.79
	2,000	Hydra Oil	1.51
Sell:	20	Algol Aluminum	48¾
	300	Scorpius Seashell	27½
	10	Rigel Cement	115¼
	1,000	Alderstaff Biscuits	15½
3. Buy:	1	Gold Shred Mines	180.00
	100	Lyra Instrument	53¼
	5	Dixie Plough Co.	55½

Sell:	25	Auriga Car	17½
	37	Capella Truck	63¾
	110	Hercules Gym Products	11¼
	500	Pegasus Foods	.98
4. Buy:	27	Cygnus Mattress	.25
	550	Abbetoir Furniture	.98
	875	Ancaster Oil Co.	8.21
	790	Pollex Dental	.76
Sell:	380	Taurus Canneries	3.28
	610	Gem Films	17¼
	1	Dexter Corporation	101⅞
	510	Andromeda Chains	13⅞

## SECTION 7 Bonds

Bonds are forms of long-term notes promising to pay back money borrowed. If you purchase a bond, you are lending a company money, and this company will agree to pay back the money on a set date, known as the *maturity* date. For the use of this money, the company agrees to pay a set rate of interest of, say, 3%, 4%, or 5% per annum.

Unlike a shareholder, a bondholder is not a part owner of the company but a creditor of the company.

Figure 4-11



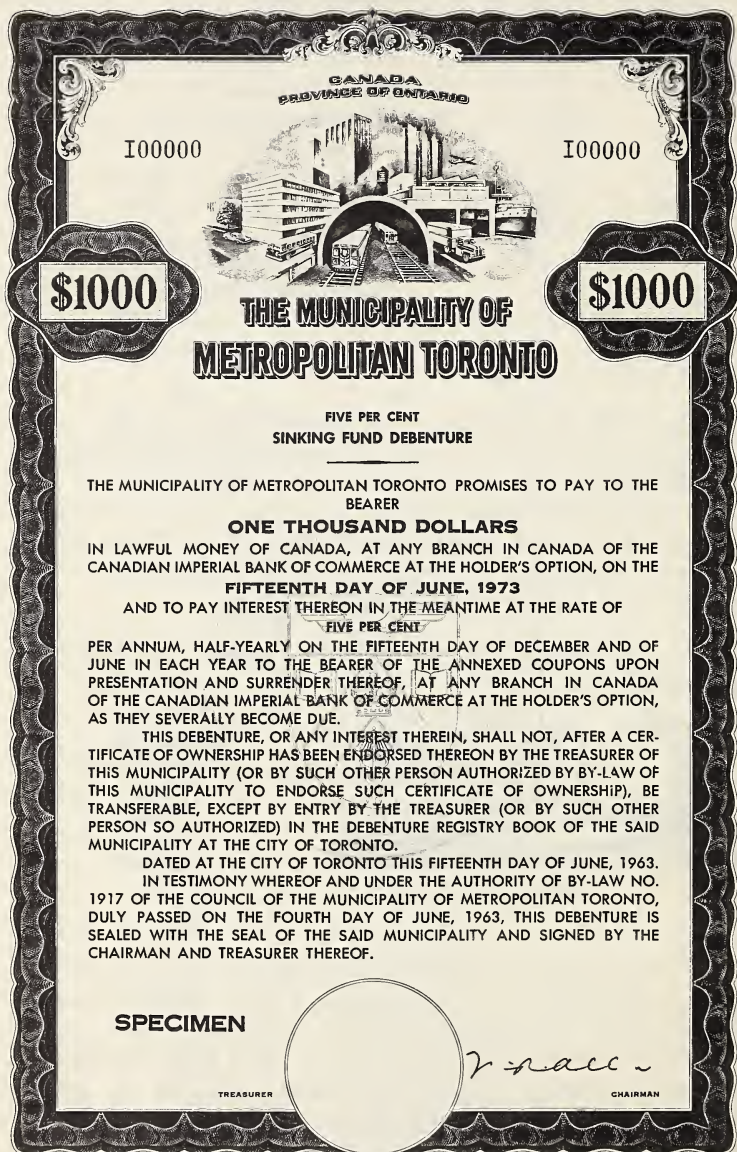
One of the advantages of being a bondholder is that, should the company go bankrupt, the bondholders must be repaid before the shareholders receive back any of their investment. Because of this, investment in bonds is considered the very safest kind of investment.

Bonds are issued as a means of raising money by the federal, provincial and municipal governments and by individual corporations. They come in denominations of \$100, \$500, \$1,000 and \$5,000; and occasionally in denominations of \$50, \$25,000, \$100,000 and \$1,000,000.



Figure 4-12

## A Municipal Debenture Bond





## Purchase of Bonds

Bonds may be purchased through your stock broker in the same way as shares; the commissions charged are as shown in figure 4-13. In addition, Canada Savings Bonds are available through your bank and usually through a payroll deduction plan at your place of business. Your employer will deduct an amount from your pay each week, over a period of six months or a year, until your bond is paid for and then hand you the bond. This is a very easy way to purchase a bond and save your money. The banks will also allow you to purchase Canada Savings Bonds through them on the instalment plan.

**Figure 4-13**

### Bond Commissions

- (a) Government of Canada bonds maturing in more than one year:  $\frac{1}{4}\%$  of the selling price, with a minimum of 25¢ per \$100 of the principal amount.
- (b) All other bonds:  $\frac{1}{2}\%$  of the selling price, with a minimum of 50¢ per \$100 of the principal amount.
- (c) Government of Canada bonds maturing within one year: The charging of commission will be at members' discretion.
- (d) Bond transactions not on the floor may be on a net basis, that is, without commission.

## Actual Price From Quoted Price

Bond prices, like stock prices, are quoted in the daily press as shown in figure 4-14. The quoted price is always given for units of \$100 of the par value. Thus, a \$1,000 bond quoted at  $\$98\frac{1}{4}$  would mean that the price of the \$1,000 bond was \$98.25 per \$100 or \$982.50.

The first column, after the name of the bond, indicates the rate of interest paid on the face value of the bond; this is followed by the year of maturity when the face value of the bond will be repaid. The next two columns give the last price bid for the purchase of a bond and the last price asked for the sale of a bond. The last column gives last week's bid price.

*Example:* Garry Carmichael purchased the following bonds: 1 \$1,000 Hudson Bay Oil at \$1.00 more than the bid price; 2 \$100 Massey-Ferguson at the asked price; 2 \$1,000 Metro Toronto at the midway point between the bid and asked price.

What would be the price of the bonds? What would be his annual income from these bonds? When would the principal be repaid?

<i>Bond</i>	<i>Cost Price</i>	<i>Annual Income</i>	<i>Year Principal Repaid</i>
Hudson Bay Oil:			
1,000 at \$86 = \$ 860.00			
Commission (min.) <u>5.00</u>	\$ 865.00	\$ 40.00	1975
Massey-Ferguson:			
200 at \$92½ = \$ 185.00			
Commission (min.) <u>1.00</u>	186.00	9.00	1976
Metro Toronto:			
2,000 at \$95 = \$1,900.00			
Commission (min.) <u>10.00</u>	<u>1,910.00</u>	<u>107.50</u>	1980
	<u>\$2,961.00</u>	<u>\$156.50</u>	
The price of the bonds would be \$2,961.00.			
The annual interest received would be \$156.50.			

### WORKOUT EXERCISE VII

For the following bonds, calculate the purchase price and the annual income; state the date of repayment and the net change in the bid price from the previous week.

1. 5 \$1,000 Consumers Gas, purchased at the halfway point.
2. 3 \$750 Mexican Light & Power, purchased at the halfway point.
3. 5 \$100 Trans-Canada Pipe Line, purchased at the asked price.
4. 4 \$1,000 Dominion Stores, purchased at last week's bid price.
5. 3 \$500 Great Lakes Paper, purchased at \$1.00 less than the asked price.
6. 7 \$50 Massey-Ferguson, purchased at the bid price.
7. 4 \$100 Price Bros., purchased at the halfway point.
8. 9 \$50 Salada-Shirriff-Horsey, purchased at the halfway point.
9. 3 \$1,000 Traders Finance, purchased \$1½ over the bid price.
10. 3 \$5,000 Imperial Tobacco, purchased \$1½ below the asked price.
11. What are the main differences between being a shareholder and being a bondholder?
12. Discuss reasons for investing in bonds. Compare them with reasons for investing in share certificates.

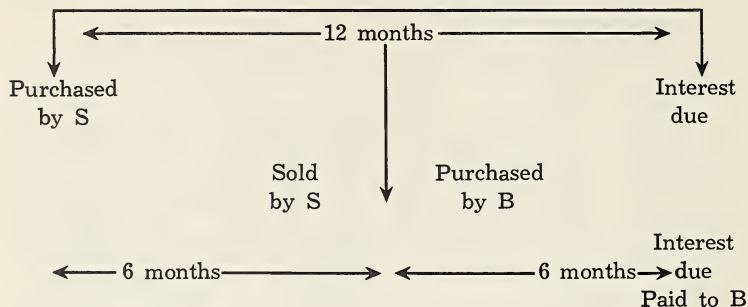
Figure 4-14

## Newspaper Quotations

CORPORATION BONDS							CANADIAN BONDS						
By Investment Dealers' Assoc. of Can.							By Investment Dealers' Assoc. of Can.						
GOVERNMENT OF CANADA BONDS							GOVERNMENT OF CANADA BONDS						
Public Utility Issues:	Int. Rate	% Due	Bid	Ask	Prev. Week Bid				Bid	Asked			
Alg Cen H.B.R...	5¼	'79	98½	...	98½		3¾	1 Sept. 1965	95.50	97.00			
Bell Phone	5	'72	97¼	98¾	97¼		2½	15 June 1967/68	87.50	89.00			
Braz Traction							5½	1 April 1969	101.75	103.25			
L. & P.	4¾	'70	76	81	75		3½	1 May 1970	89.25	91.25			
B. C. Electric	5½	'88	91½	94½	92½		4¼	1 Sept. 1972	91.25	92.75			
Do.	5¾	'77	98¾	101¼	98¾		5½	1 Oct. 1975	100.25	101.75			
Calgary Pwr.	3¼	'72	85	1	85		3¼	1 June 1974/76	78.50	80.00			
Consumers Gas	5	'78	95½	98½	95¾		3¾	15 Jan. 1975/78	82.75	84.25			
Gt. Lakes Pr.	5¾	'77	100	102	100		3¼	1 Oct. 1979	76.25	77.75			
Maclaren-Quebec							4½	1 Sept. 1983	89.50	91.00			
Power	3	'69	85	...	86		3¾	15 Mar. 1996/98	75.25	77.25			
Mexican L. & P.	5	'75	70	77	71		3	Perpetuals	67.50	69.50			
Que. Nat. Gas	5¾	'85	70	80	70		GOVT. OF CANADA GUARANTEED						
St. Maurice Pr.	3¼	'70	84¾	87¼	84¾		CNR 2¾	2 Jan. 1964/67	88.25	89.75			
Tr. Can. P. L.	5.85	'87	97	98½	96¾		do 4½	1 April 1967	97.50	99.00			
W'coast T. Deb.	5½	'88	90½	92½	89		do 3¼	1 Feb. 1972/74	86.00	87.50			
Industrial Issues:							do 4	1 Feb. 1981	83.50	85.00			
Abitibi Pr. P.	6¼	'77	102½	105½	102½		do 5¾	1 Jan. 1985	102.75	104.75			
Do.	4	'74	88	...	88		do 5	1 Oct. 1987	93.75	95.25			
Alum. of Can.	4½	'73	93	95½	92½		COMMONWEALTH OF AUSTRALIA						
Bathurst P. & P.	5¼	'73	93	95½	96		4	1 Nov. 1970	87.00	89.00			
Can. Steamship	4	'66	94	...	94		INT'L BANK RECONSTRUCTION AND DEVELOPMENT						
Cdn. Brew.	4¼	'81	92¼	94¾	92¼		3¼	1 April 1965	91.50	93.50			
Cdn. Chem. Co.	5¼	'71	97	99½	97		3½	1 June 1969	88.00	90.00			
Cdn. Oil	4	'76	86	89	86		PROVINCIAL AND PROVINCIAL GUARANTEED						
CPR	3¾	'72	85	87	85		Ont. 3	1 Nov. 1963/65	91.75	93.75			
Do.	3½	'66	92½	94½	92		do 5½	1 May 1970	100.50	102.50			
Can-Met	5½	'63	97½	99½	97½		do 6	15 Nov. 1977/79	102.00	104.00			
Cockshutt F. E.	4¼	'65	92	94	91½		do 5½	1 May 1978/80	97.50	99.50			
Dom. Fdrs. & S.	4½	'69	93¾	96¼	93¼		O.H. 4¼	1 Nov. 1964/67	94.00	96.00			
Dom. Stores	5½	'76	98½	101¼	98¼		do 3	1 April 1968/70	84.50	86.50			
T. Eaton Accep.	4¾	'74	92	95	92		do 5	1 April 1974/77	93.50	95.50			
E. B. Eddy	4	'74	83	...	83		do 5½	15 July 1978/80	97.50	99.50			
G. Motors Acc.	4¾	'69	95¾	97¾	95¾		N.B. 4½	15 Oct. 1968/71	89.50	91.50			
Gt. Lakes Pap.	5	'76	93½	96½	93½		do 5	1 Oct. 1974/77	91.00	93.00			
Great Win. Gas	5½	'80	94	96	94		N.S. 4¾	1 Dec. 1975/77	89.00	91.00			
Hud. Bay O&G	4	'75	85	87	85½		do 5½	15 July 1978/80	96.50	98.50			
Imp. Tobacco	3	'70	85¾	88¼	85¾		Que. 4¾	15 Jan. 1974/77	91.00	93.00			
Imp. Oil	3	'69	88½	92	88½		AlbT 4¼	2 July 1976/78	86.00	88.00			
Loblaw Groc.	6	'77	101	104	101		B.C. 3	15 June 1964	92.00	94.50			
Massey-Ferg.	4½	'76	90½	92½	90		Man. 5½	1 June 1976/79	96.00	98.00			
Shell Oil	4½	'78	90½	92½	90½		M.H. 5¼	15 Sept. 1977/81	93.50	95.50			
Phillips Elect.	5	'73	91	...	91		Sask. 4½	1 Nov. 1974/76	87.00	89.00			
Price Bros.	3¼	'66	89¾	92¼	89¾		do 5½	15 July 1978/80	96.00	98.00			
St. Law. Corp.	5	'72	95¼	97¾	94½		Nfld. 4¾	15 July 1962/64	95.00	97.00			
Sal-Shirriff-H.	6	'77	99¾	102¼	99¾		do 5¼	1 Feb. 1977/79	90.00	93.00			
Simpsons Ltd.	4¾	'73	93	...	93½		MUNICIPAL BOND QUOTATIONS						
Steel Co.	2¾	'67	88¾	91¼	88¾		Halifax 4¼	1971	86.00	88.00	5.80		
Traders Finance	4¾	'71	93	95½	93½		Hamilton 6	1979	99.00	101.00	5.91		
Union Accep.	5¼	'68	92	...	93		Metro Tor. 5¾	1980	94.00	96.00	5.72		
Westons, Geo.	4¾	'71	95	97	95		Montreal 6	1979	98.50	100.50	5.95		
							Ottawa 5½	1979	96.00	98.00	5.67		
							Regina 5¾	1982	94.00	96.00	6.09		
							Vancouver 6	1980	98.00	100.00	6.00		
							Winnipeg 5½	1980	94.00	96.00	5.84		

## Accrued Interest On Bonds

The interest that you earn on the bonds you purchase will be paid to you on definite interest dates and will represent the amount your money has earned for you since the last interest date. Now, suppose you buy your bond midway between two interest dates; then the next interest payment should belong both to you and to the person from whom you bought the bond in the ratio of the length of time you each owned the bond. This is shown in figure 4-15.

**Figure 4-15****\$1,000 Bond, Interest \$50 P.A.**

On the interest date the company pay the interest due to "B", the current holder of the bond. As "B" would not, at this time, wish to get in contact with "S" and pay over to him his share of the interest, it is customary at the time the bond changes hands for the buyer to recompense the seller for his share of the next interest payment. That is, in addition to the price of the bond, "B" (the buyer) must pay to "S" (the seller) the amount of the interest that has accrued to "S" from the last interest date up to the date of the sale.

*Example:* Graham Smith purchases a \$5,000, 6% bond paying interest twice a year on January 1 and July 1 for \$101¼. If he purchases it on April 1, what will be the total cost of the bond purchase?

Purchase price: \$5,000 at \$101.25	= \$5,062.50
Accrued interest:	
Semi-annual interest	= \$150
Accrued for 3 months	
(due to seller)	= \$ 75
	75.00
Brokerage commission	25.69
Total cost of purchase	= <u><u>\$5,163.19</u></u>

### WORKOUT EXERCISE VIII

Assuming that the bonds purchased in Workout Exercise VII all pay interest twice a year, how much extra would have to be added to the purchase price under the following conditions? Draw the time line illustrated in figure 4-15 for each problem.

1. Consumers Gas, purchased three months after interest date.

2. Mexican Light & Power, purchased four months after interest date.
3. Trans-Canada Pipe Lines, purchased two months after interest date.
4. Dominion Stores, purchased one month after interest date.
5. Great Lakes Paper, purchased one month before interest date.
6. Massey-Ferguson, purchased two months before interest date.
7. Price Bros., purchased three months before interest date.
8. Salada-Shirriff-Horsey, purchased one and a half months before interest date.
9. Traders Finance, purchased four and a half months before interest date.
10. Imperial Tobacco, purchased one and a half months after interest date.
11. Cecil Adams purchased a \$1,000,  $6\frac{1}{2}\%$  bond on March 1, which was quoted at  $103\frac{1}{4}$ . Interest dates are January 1 and July 1. How much did Cecil Adams pay for the bond, excluding brokerage?
12. Fred Morningstar purchased a \$500,  $7\frac{1}{4}\%$  bond on September 15, priced at  $\$97\frac{3}{4}$ . If the interest dates are June 1 and December 1, how much did the bond cost?
13. Interest on the bonds of Gold Star Products Limited is paid each quarter on January 1, April 1, July 1, and October 1. How much will Joe Carote pay for a \$5,000, 5% bond quoted at  $\$103\frac{1}{4}$  which he buys on March 1?
14. The  $7\frac{1}{2}\%$ , \$500 Startown Municipal bonds pay interest on July 1 each year. If the quoted price is  $\$98\frac{7}{8}$ , how much will a bond cost if purchased on December 15?
15. The  $6\frac{1}{4}\%$ , \$1,000 bonds of the Independent Roadster Ltd. are quoted at  $\$97\frac{3}{4}$ . They pay their interest yearly on October 15. How much is paid for a bond purchased on December 1?
16. On March 15 Silas Christopher purchased a \$5,000,  $6\frac{1}{4}\%$  bond quoted at  $\$101\frac{1}{4}$  which pays interest January 1 and July 1. At the same time he sold five \$1,000,  $5\frac{3}{4}\%$  bonds quoted at  $\$97\frac{3}{4}$  which pay interest on February 1 and August 1. How much extra would he have to pay out? Include commission and transfer tax.
17. In order to raise money to buy new machinery, the Tackle & Cord Co. sell an issue of bonds. If the bonds are quoted at  $\$95\frac{1}{4}$ , how much will they receive on September 1 for the sale of 1,000  $5\frac{1}{2}\%$ , \$1,000 bonds which will pay interest August 1 and February 1. The fee charged for the sale of the bonds by the investment house amounts to 1% of the realized price.



18. On November 15, the Weather Balloon Manufacturing Company sell an issue of 1,000,  $5\frac{1}{4}\%$ , \$500 bonds quoted at  $\$98\frac{1}{2}$ ; and 500,  $6\frac{1}{4}\%$ , \$1,000 bonds quoted at  $\$101\frac{1}{4}$ , both paying interest on January 1 and July 1. If the investment house charge them  $1\frac{1}{2}\%$  fee for selling the bonds, what are the total proceeds from the sale? Fee is charged on the face value.

## SECTION 8      Rate of Yield On Investments

The rate of the return on your investment is the annual income you receive in the form of dividends and interest expressed as a percentage of your total investment. The formula is:

$$\text{Rate of income} = \frac{\text{Annual income}}{\text{Investment}} \times \frac{100}{1} \quad (2)$$

The rate of income is therefore the "yield" rate on your investment and is not always the same as the rate quoted on the stocks or bonds. Your annual income is found as follows:

$$\text{Annual income} = \text{Rate of income} \times \text{Investment} \quad (3)$$

*Example:* Art Thompson owned 75 preferred shares of Art Metal Limited for which he paid \$33 a share and which paid a 5% dividend on the par value of \$25 a share. He also owned a \$1,000 Trans-Bar  $5\frac{1}{2}\%$  bond purchased for  $\$99\frac{1}{2}$ . What was his annual income? What was the yield on his investment? (Brokerage commission can be ignored.)

Annual income:

Art Metal Limited shares:

$$75 \times 0.05 \times 25 = \$ 93.75$$

Trans-Bar bond:

$$\$1,000 \times 0.055 = \underline{55.00}$$

Total annual interest

$$\underline{\underline{\$ 148.75}}$$

Total amount of investment:

Art Metal Limited shares:

$$75 \times 33 = \$2,475.00$$

Trans-Bar bond:

$$\underline{\underline{995.00}}$$

$$\underline{\underline{\$3,470.00}}$$

$$\text{Yield on investment: } \frac{148.75 \times 100}{3,470} = 4.29\%$$



**WORKOUT EXERCISE IX**

1-4. Calculate the rate of income, or yield rate, for problems 1-4, Workout Exercise VI.

5-14. Calculate the rate of income, or yield rate, for problems 1-10, Workout Exercise VII.

15. Mr. Cartwright wishes to obtain a 5% yield on his investment. What is the highest price, including brokerage, he can pay for a \$1,000, 6% bond and obtain the desired yield?

16. Ann Fleet wishes to buy a  $5\frac{1}{2}\%$ , \$5,000 bond of the Fair Lady Corporation. If she desires a 6% return on her money, how much can she pay for the bond, including brokerage?

17. At what price should a 5% bond be purchased in order to obtain a yield of  $5\frac{1}{2}\%$ ?

18. Joan Miller purchased five \$1,000,  $4\frac{1}{2}\%$  bonds at \$115 $\frac{1}{2}$  plus a brokerage fee of \$2.25 per bond; and three \$2,000,  $5\frac{1}{4}\%$  bonds at \$91 $\frac{1}{4}$  plus a brokerage fee of \$4 per bond. What yield on her total investment does Joan Miller enjoy?

19. Carron Chapel purchased 100 shares of Trim Leaf Tobacco for \$99.80 a share. Last year they paid quarterly dividends of \$ .95, \$1.25, \$1.20, and \$1.05. What was Carron's annual yield rate on her investment?

20. The Hercules Products Corporation have not paid a dividend for the last two years. This year they are going to distribute \$30,000. Their issued capital includes: 1,500 common shares; 1,000 \$50, 5% cumulative preferred shares (this means that *all* back dividends must be paid to these shareholders before any other shareholders can receive any dividends); 1,200 \$100, 6% noncumulative preferred shares (only the current year's dividend need be paid before distribution to other shareholders). How much will be paid per share to shareholders holding each kind of stock?

**SECTION 9     Income Tax Payable**

Personal income taxes are paid on an individual's total income less the amount of the allowable personal deductions. In order to encourage the Canadian investor to invest his money in Canadian enterprises, in 1949 the Government made a change in the Canadian income tax law.

The taxpayer is now allowed to reduce his income tax payment by an amount equal to twenty per cent of the dividends he receives

in a given year on common or preferred shares issued by Canadian companies that pay Canadian income taxes.

*Example:* Tom Wither earns \$7,000 a year and has an additional income from bonds of \$5,000 a year. His personal exemptions amount to \$2,000. His taxable income is therefore \$10,000 per year.

Tax payable on \$10,000 is \$2,260.

Mr. Withers decides to sell his bonds and invest the money in common stocks. Assuming he earns the same net income in dividends, his income tax payable would now be computed as follows:

Tax payable on \$10,000	\$2,260
Less 20% of \$5,000	<u>1,000</u>
Tax payable	<u><u>\$1,260</u></u>

It can be seen, therefore, that there is substantial relief from payment of income tax to be obtained by investing in dividend-paying Canadian companies.

### WORKOUT EXERCISE X

From figure 4-16 calculate the income tax payable and the saving in income tax in each of the following cases:

1. Total income, including \$5,000 bond interest, is \$9,600; bond investment is changed to preferred stocks in a Canadian company where the same income may be earned.
2. Total income is \$9,350 and includes \$2,500 from foreign investment; the investment is transferred to a Canadian company.
3. Total income is \$7,250 and includes \$1,500 from non-Canadian investments. A transfer to Canadian companies results in dividends of \$1,350. How does this reduction in dividends affect the total picture?
4. Total income is \$9,750 and includes \$2,300 from bond interest. A transfer to Canadian companies results in dividends of \$2,450.
5. Daniel Devet invested \$91,387.50 in 4¾%, \$1,000 bonds purchased at \$121¼, plus brokerage of \$6.00 per bond. How many bonds did Mr. Devet buy? What total annual income did he receive from the bonds? What rate of income did this represent on his investment? How much income tax would he save if this income had come from Canadian tax-paying corporations?

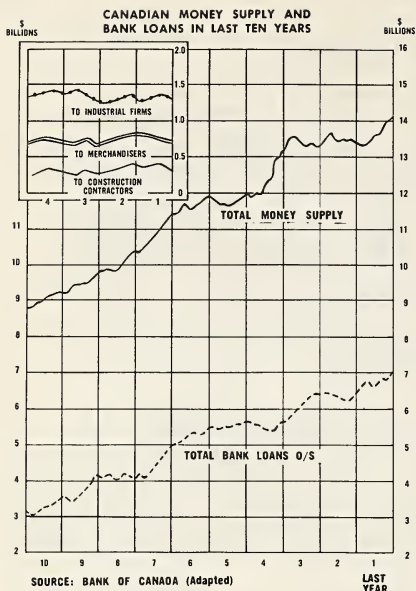
**Figure 4-16****Income Tax Payable**

Income Per Year Less Exemptions	Yearly Income Tax Payable
\$6,000	\$1,140 + 26% on next \$2,000
8,000	1,660 + 30% on next \$2,000
10,000	2,260 + 35% on next \$2,000

**SECTION 10 Figuring for Fun**

1. If your grandfather had purchased one original \$100 share certificate when the Ford Company of Canada Limited first incorporated about fifty years ago, the stock today would be worth \$140,000; and, in addition, your grandfather would have received another \$61,000 in dividends. See if you can trace another large company back to its origin.

2. Pretend you have been left \$10,000 and wish to invest the money in stocks. Choose at least ten different stocks you would like to own (if possible, explain your class project to a broker and ask his advice). Then keep a record (called a "portfolio") until the end of the school year of how your investment is progressing, including the recording of any dividends you would receive on the shares. You will find the record of dividends to be paid published in the daily and weekly papers.



# Borrowing Money From a Bank

5

## A Business Problem

Daly and Mason Limited manufacture safety belts which they sell to small retailers on whom they draw 60-day drafts. On July 15, they purchase an additional building for \$15,000 on which they must make an immediate down-payment of \$6,000. They can borrow this money from a bank and repay it in twelve equal monthly instalments plus interest at 6% per annum on the monthly balance. Alternatively, they can discount the following drafts at the bank at a discount rate of 6%: \$1,000 due August 15; \$2,500 due September 1; \$1,500 due July 31; \$1,200 due September 10.

Which method is the cheaper? What other factors must be considered? How would you advise Daly and Mason Limited?

One of the main functions of a bank is to lend money. The banks form an important source from which individuals and small and large organizations obtain short-term loans. Except under special circumstances, a bank is not interested in making long-term loans. Short-term loans are loans that are repayed within one year. The money a bank loans is composed primarily of the money held on deposit for customers. As the customers can withdraw their deposits on demand, or at short notice, a bank must always be in a position to meet these demands by having cash available, and, therefore, cannot invest cash in long-term loans which are not 'liquid'; that is, cannot readily be turned into cash.

## SECTION 1 Personal Loans

An individual desiring a loan from a bank should contact the manager of the bank and tell him the amount he wishes to borrow, the purpose for which he desires the money, and what security he has to offer to cover the loan. Two important points should be kept in mind:

1. The bank is not doing the borrower a favour; it is part of the bank's business to lend money.
2. The money the bank lends has been placed in its custody for safe-keeping; therefore the bank must take every precaution to make sure the money is protected and the loan repaid.

If the manager is satisfied with the information given him, he will then arrange the amount and the terms of the loan, and, on completion of the negotiations, the money will be paid to the individual in cash or deposited in the person's bank account.

It is customary for the borrower to sign a *promissory note* promising to pay the money back at a certain time or times. Promissory notes with interest added to principal and promissory notes discounted at the source have been studied earlier in the course.

A promissory note payable "on demand" is shown in figure 5-1. No definite repayment date is stated in this type of note; the loan being due, at least theoretically, whenever the bank decides to call it. Repayment of the loan, however, is usually arranged to suit the borrower and is frequently paid off in monthly instalments. Interest is payable monthly during the term of the loan.

Figure 5-1 A Demand Promissory Note With Interest

From THE INTEREST  
LAWYERS OF CANADA

1-2 TORONTO 1, ONT.  
MAIN OFFICE - KING & BAY STS.  
(BRANCH)

August 15 19 -- \$500<sup>00</sup>

On demand I promise to pay  
to the order of The Bank of Montreal  
the sum of Five Hundred <sup>00</sup>/<sub>100</sub> Dollars  
with interest payable monthly at the rate of 6 per cent. per annum, up to and  
after maturity and until actual payment, at the Bank of Montreal  
here. Value received.

Gertude Entwistle

BANK OF MONTREAL

Security satisfactory to the bank is usually either *collateral* in the form of bonds or shares belonging to the borrower which the bank



will hold until the loan is paid; or an *endorsement* by a guarantor who pledges to repay the money should the borrower default. In the latter case, the wording of the promissory note is changed from "I promise to pay" to "*we jointly and severally promise to pay.*"

### Repayment

The note may be paid back in one repayment of principal, or it may be paid back in instalments. Figure 5-2 shows a promissory note where the loan is repayable in instalments. Arrangements can be made with the bank to withdraw the repayments from the borrower's account each month together with the interest payments, if any.

*Example:* Chris Cannon borrowed \$1,000 from the bank to purchase a new outboard motor and boat. He left as collateral 30 common shares of the Tribell Telephone Company. If he had to repay this loan in ten equal monthly instalments plus 6% interest on the monthly balance, how much did the bank withdraw from his account each month?

Instalments	Principal Repayment	Balance Due	Interest Payable At 6% P.A.	Total Monthly Payment
1st month	\$ 100	\$1,000	\$ 5.00	\$ 105.00
2nd month	100	900	4.50	104.50
3rd month	100	800	4.00	104.00
4th month	100	700	3.50	103.50
5th month	100	600	3.00	103.00
6th month	100	500	2.50	102.50
7th month	100	400	2.00	102.00
8th month	100	300	1.50	101.50
9th month	100	200	1.00	101.00
10th month	100	100	.50	100.50
	\$1,000		\$27.50	\$1,027.50

### WORKOUT EXERCISE I

Draw up schedules, as indicated in the last example, to show the repayment of the following loans plus the payment of interest charged at 6% per annum on the loan balance.

1. Weather Balloon Manufacturers Limited borrow \$5,000 to be paid back in ten equal monthly instalments.
2. Longstand & Sumpter Limited borrow \$2,763 to be repaid in nine equal monthly instalments.



3. Village Novelties borrow \$892 to be repaid in four equal quarterly instalments.
4. Crane Trucks borrow \$25,680 to be repaid in twelve equal monthly instalments.
5. Dane Construction Company borrow \$425,160 to be repaid in nine quarterly instalments.

**Figure 5-2 Promissory Note: Loan Repayable In Instalments**

L.F. 177 Rev. Aug. 1944. Promissory Note—Loan Repayable in Instalments  
CAN. 36196 Printed in Canada

REF. No. AKG-10 King & Yonge Sts., Toronto, June 8/19-0 \$1,000.

For value received I promise to pay to the order of The Bank of Montreal at the BANK OF MONTREAL here, the principal sum of One Thousand 100 DOLLARS, said principal sum to be payable as follows: One Hundred 100 Dollars on the 15th day of July 19-0, and One Hundred Dollars on the 15th day of each and every month thereafter until the 15th day of April 19-1, on which said date the entire balance of principal then unpaid shall become due and payable. In case said instalments, or any of them, are not paid the day the same become due, the whole of the balance of the said principal sum then unpaid shall forthwith become due and payable at the option of the holder of this note. In the event that I shall fail to make any of the payments above provided for I promise to pay 6% per annum on each such defaulted payment from the date of default until payment to the holder of this note.

Address: 1670 Aberdeen Rd Frieda Ormstead  
Telephone: Scarborough, Ont

## SECTION 2 Company Loans — Notes and Drafts

Business firms can also obtain loans by posting securities with the bank or by “pledging” some of their business assets, such as their accounts receivable. Another form of borrowing available to business firms is the discounting of notes and drafts. A *draft*, as you will have learned in your bookkeeping course, is a negotiable instrument or a bill of exchange. A *time draft*, the type in which we are primarily interested at this time, is a bill of exchange payable on a definite future date. These drafts can be interest-bearing or non-interest-bearing. Figure 5-3 shows a form of non-interest-bearing commercial draft. These are also called *trade acceptances*.

### Payment by Draft

To review the steps to be followed when paying a debt by means of a draft and the part a bank plays, let us assume that John Buyer, Buxton, purchases a refrigerator from Dick Seller, Toronto, and owes him \$400. Seller is the *drawer*, Buyer is the *drawee*, and the bank is the *payee*.

#### Procedure:

1. Dick Seller of Toronto, the creditor, draws a draft on John Buyer

of Boxton, the customer. Seller deposits the draft with his branch bank (in this case, the Bank of Montreal in Toronto). Seller's bank forwards the draft to its branch bank in the city in which Buyer lives (i.e., the Bank of Montreal in Boxton), and this bank presents the draft to Buyer.

2. John Buyer accepts the draft by writing "accepted" across the face of the draft and names the branch to which he wishes to pay the account (in this case, the Royal Bank in Boxton). The drawee will usually wish to pay the draft at the bank in which he keeps his account.

3. The bank named by Buyer holds the draft until the maturity date, which in this case is 30 days after January 15 plus 3 days of grace allowed by law; that is, February 17.

4. On February 17, or the first legal banking date thereafter, the bank named by the drawee, Buyer, (the Royal Bank in Boxton) takes \$400 out of Buyer's account, transfers it to the branch of the Bank of Montreal in Boxton, who in turn transfers it to the original branch in Toronto (Seller's bank, the Bank of Montreal in Toronto).

5. The Bank of Montreal in Toronto deducts bank charges of  $\frac{1}{8}\%$  of the amount of the draft and deposits the remainder in the account of Dick Seller. A *credit memo* is then forwarded by the bank to Dick Seller notifying him that this amount has been collected and credited to his account.

### SECTION 3      Discounting a Non-Interest-Bearing Note or Draft

If Dick Seller needs the money immediately, he can ask the bank if they will *discount* the draft and pay him the proceeds before the draft matures. Discounting was studied in Chapter 2. Step 3 of the procedure in the payment of a draft described above shows the bank holding the draft. If the draft is discounted at this step, Dick Seller receives payment less discount and less bank charges immediately, while the bank continues to hold the draft until the maturity date. Step 4 is the same as above except that the proceeds now belong to the bank. The transaction is now completed. (Step 5 does not apply because Seller has already received payment.)

*Example:* Dick Seller discounted the above draft at the bank on January 25. If the bank discount rate is 6% and the bank charges  $\frac{1}{8}\%$ , how much did he receive in payment of the draft?

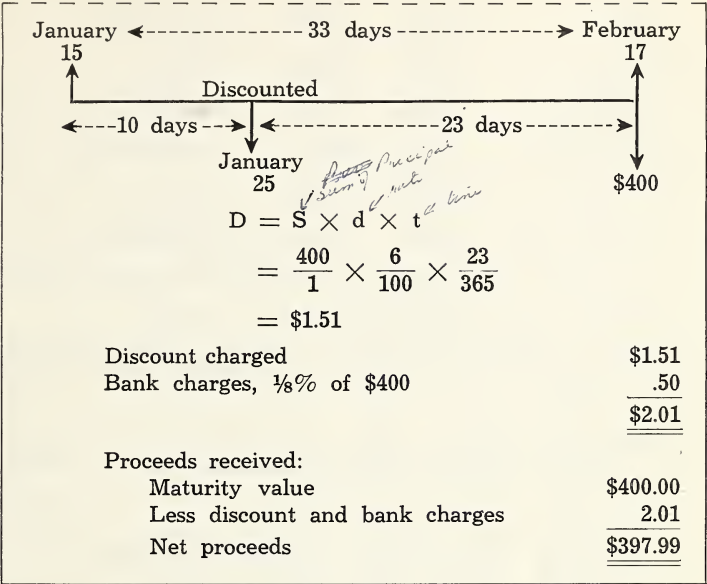


Figure 5-3      A Non-Interest-Bearing Commercial Draft

Form 545  
UNIVERSAL BANK  
SPACE BELOW FOR ACCEPTANCE STAMP

*Accepted*  
January 16, 19-1  
Payable at Royal Bank of Canada  
John L. Buyer

*Due February 17, 19-1*  
TORONTO, ONT. *January 15, 19-1*

*Thirty days after date, for value received pay to the order of Bank of Montreal the sum of*  
*Four Hundred and no/100 Dollars \$400.00*

*To John L. Buyer*  
*(Boston)*  
*Ontario*

*Jack Seller*

FORWARDING BANK'S NUMBER

RECEIVING BANK'S NUMBER

WORKOUT EXERCISE II

Find the proceeds of the following discounted drafts using a time line on which to record all the information. Bank charges are  $\frac{1}{8}\%$  of the value of the draft with a minimum charge of 20¢, and the bank discount rate is 6%.

Date	Amount	Term	Discounted
1. January 15	\$1,400.00	30 days	January 20

<i>Date</i>	<i>Amount</i>	<i>Term</i>	<i>Discounted</i>
2. April 11	550.00	20 days	April 15
3. July 21	3,020.00	30 days	July 22
4. September 14	718.00	90 days	September 15
5. December 9	840.16	60 days	December 21
6. March 20	432.10	90 days	April 10
7. August 28	198.15	10 days	August 31
8. November 17	1,682.22	30 days	November 25
9. February 26	734.17	1 month	February 28 (leap year)
10. June 23	375.44	60 days	June 30

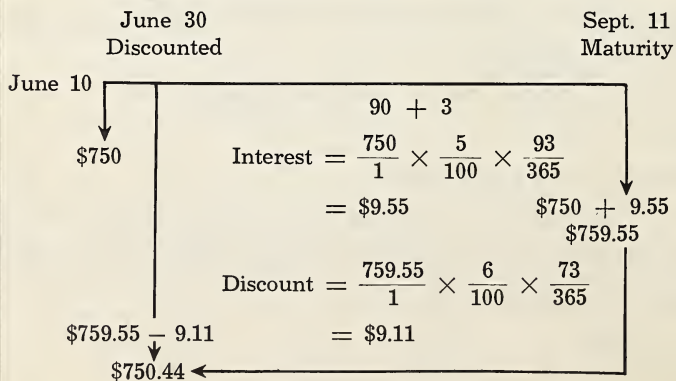
11. What is a draft? Describe how it is routed; when it is held to maturity; when it is discounted by the drawer. Name the steps in each case.

12. Draw up the drafts for three of the drafts in problems 1 to 10 above filling in names for the drawer, the payee, and the drawee.

#### SECTION 4 Discounting an Interest-Bearing Note

If a note bears interest (see Chapter 2 for the form), we must first find the value of the note on the maturity date after the interest has been added. This maturity value is then discounted. Drafts do not, as a rule, bear interest.

*Example:* The Fleming Company hold a 90-day, 5% per annum, promissory note for \$750 dated June 10. On June 30 they discount this note at the bank at 6% per annum. Find the proceeds.



Bank charges	$= \frac{1}{800} \times \frac{759.55}{1} =$	\$ .94
Interest to maturity		\$ 9.55
Value at maturity		\$759.55
Discount, 73 days		\$ 9.11
Bank charges		\$ .94
Proceeds		\$749.50

**WORKOUT EXERCISE III**

Find the proceeds for each of the following notes:

<i>Date of Note</i>	<i>Face Value</i>	<i>Time</i>	<i>Interest Rate</i>	<i>Discount Rate</i>	<i>Discount Date</i>
1. January 15	\$1,000.00	30 days	5%	6%	January 18
2. May 1	\$ 750.00	60 days	4%	7%	May 11
3. September 5	\$2,225.00	90 days	5%	7%	September 25
4. July 10	\$9,820.00	6 months*	6%	6%	July 13
5. February 14	\$ 613.00	2 months*	4%	6%	February 15
6. August 12	\$1,842.50	40 days	5½%	6%	August 31
7. March 21	\$ 375.75	10 days	4%	7%	March 31
8. June 17	\$ 943.25	20 days	4½%	6%	June 18
9. October 25	\$ 356.50	3 months*	5½%	7%	November 1
10. April 8	\$7,532.60	75 days	6¼%	7½%	April 30

11. Donald Dempster holds a 6-month note dated March 21 for \$2,500 which bears interest at 6% per annum. If he discounts it at 6% on March 30, how much does he receive?

12. Paul Purvis is in need of cash to purchase supplies. He has a customer who owes him \$3,500 plus 5% interest due in 60 days. If he draws a 60-day draft on this customer and immediately discounts it at the bank at 6%, how much will he receive?

13. On March 1, Paul Jones was notified by his bank that his account was \$615 overdrawn. He then discounted at 6% a 60-day note for \$650 dated February 25 and carrying interest at 5%. If the proceeds were deposited in his account, what was the balance in his account?

14. Carl Kent owns a 6-month, 6% note, made in his favor for \$1,400 and dated September 14. How much does Kent receive if he discounts the note on January 15 at 6%?

\* Count from date to date and add 3 days; e.g., March 15 to April 18, February 10 to March 13. Then find total days in period.



15. Bill Kite owed Lucy Green \$1,000. If he signed a 3-month note which when discounted at 6% gave him the exact amount, what was the face value of the note? Ignore days of grace.

16. Amy Crown signed a 60-day promissory note at the Traders Bank on May 6 for \$5,000 which was immediately discounted by the bank at 6%. On May 20 the bank in turn discounted the note at  $4\frac{1}{2}\%$  at the Fraser Trust Company. How much did the Traders Bank make on the transaction? What rate per cent interest on their investment does this represent?

17. On January 2 Chris Johnson discounted at 6% a 3-month promissory note for \$2,500 signed by him in favor of the Country Bank. On January 15 the Country Bank rediscounted the note at 5% at the Town Bank. How much did the Country Bank make on the transaction?

## SECTION 5 Figuring for Fun

1. Here is a simple way to demonstrate how fast you can add. To find the sum of any consecutive sequence of figures, proceed as follows: Find the sum of the numbers 12 through 23.

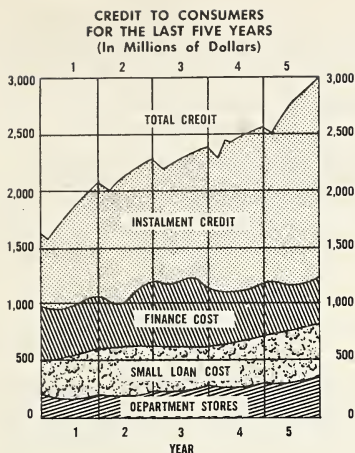
12	13	14	15	16	17
<u>23</u>	<u>22</u>	<u>21</u>	<u>20</u>	<u>19</u>	<u>18</u>
<u>35</u>	<u>35</u>	<u>35</u>	<u>35</u>	<u>35</u>	<u>35</u>

$$\text{i.e., } 6 \times 35 = 210$$

Or, add the first and last numbers and multiply the sum by one-half the number of figures to be added. If there are an odd number of figures to be added, drop the first figure, proceed as above, and then add the first figure back to the final figure.

2. During the evening a neighbour brought a box of chocolates and left it on the verandah to be divided between Jane, Julie, and Jamie. Jamie came out and ate his share and went back in without mentioning this fact. A little later Jane came out, saw the chocolates, and also ate what she thought was her share. Finally Julie came out and ate, as she thought, her share. When Jamie came out again and saw the remaining chocolates, he called the others out, and they finally cleared up the problem by distributing the remaining eight chocolates equitably between Jane and Julie so that all children received an equal number. What was the total number of chocolates? How many chocolates did each originally eat? How were the last eight divided?





SOURCE: O.B.S. (Adapted)

## Instalment Buying and Selling

### 6

#### A Business Problem

Mary Lewis is in Grade XII and has saved \$35.00. She wants to buy the following Christmas presents: a new three-speed recorder for herself costing \$55.00; a \$12.00 transistor radio for her brother; and a \$10.00 purse for her mother. Her other Christmas presents will cost approximately \$25.00. She has a part-time job in a department store on Thursday and Friday evenings and all day Saturday where she earns \$16.00 each week. She also receives an allowance of \$5.00 a week.

Mary decides that, in order to be able to purchase her presents within the five weeks left before Christmas, she will open an account in the store in which she works. She makes enquiries about the types of accounts available. The information she receives is tabulated in figure 6-1.

After studying this information and keeping in mind that part of Mary's weekly earnings must be kept for her day-to-day expenses, would you encourage her to open an account and, if so, what kind of an account?

### SECTION 1      Credit-Buying

When you buy a television set "on credit" with the understanding that you will pay the debt at specified intervals in fixed amounts, you are buying the television set on the "*instalment plan*" or "*on time*".

With instalment buying the merchandise is *used* by the buyer immediately after an initial or *down payment* but is *owned* by the seller until the last payment has been made. If you should fail to keep up your payments, the seller takes back the television set, and you lose both the television set and the payments you have already made.

When you buy goods in this way, you pay a higher price than if you paid cash. The difference, or *carrying charges*, constitutes the interest you pay on the unpaid balance plus insurance, financing charges, and the use you have of the article before owning it.

*Example:* Robinson Appliances Limited advertise Zenith Console Television sets for \$199.50 cash or: "Pay only \$2.50 a week for 2 years."

You can pay cash	\$199.50
or $104 \times \$2.50$	\$260.00
$\therefore$ Carrying charges = \$260.00 - 199.50 = \$60.50	

This method of buying on credit originated in France and was first used in Paris in the early nineteenth century. From there it eventually spread to North America, and at first was used only in the sale of sewing machines, pianos, and household furnishings. In 1916 automobiles were first sold by this method. After this, the method spread very rapidly and now includes almost every type of durable merchandise.

Because it is such an important part of our way of life, we should know the advantages and disadvantages of buying on time.

### Advantages

1. You have the immediate use of the article after only one payment.
2. The purchase and immediate use of this article may save you money. For example, your car needs a new part, or your television set needs a new picture tube, or you pay out a large laundry bill each week; but you do not have enough cash to buy the part, the tube, or a washing machine. If you purchase the required article on the instalment plan, you can regain immediate use of the car or the television set, or save the weekly laundry bill.
3. As you must meet monthly payments, you adjust your budget to include a systematic method of saving.

### Disadvantages

1. You pay a higher price for the goods.
2. It is "easy" to buy on the instalment plan, and you may be tempted to overbuy and then be unable to meet the monthly payments.
3. If you do not meet your monthly payments, you may possibly lose both the article you bought and the payments already made.

4. The extra price for carrying charges is often high, and you seldom know the exact interest rate you are being charged.
5. You make the obligation to pay now, assuming your future earnings will be adequate to meet the payments.

If we learn to calculate the exact amount of interest we pay when we purchase an article on time and then carefully weigh the advantages and disadvantages each time, we shall become "wise borrowers".

### WORKOUT EXERCISE I

1. Discuss the advantages and disadvantages of credit-buying. When do you think you should buy on credit? When do you think you should pay cash?
2. What are the carrying charges for the following purchases if bought on time?
  - (a) \$50.00 cash or \$10 a month for 6 months.
  - (b) \$100.00 cash or \$18 a month for 6 months.
  - (c) \$150.00 cash or \$28 a month for 6 months, or \$14 a month for 12 months.
  - (d) \$200.00 cash or \$35 a month for 6 months, or \$19 a month for 12 months, or \$13 a month for 18 months, or \$10 a month for 24 months.
  - (e) \$500.00 cash, or \$87 a month for 6 months, or \$45 a month for 12 months, or \$32 a month for 18 months, or \$25 a month for 24 months, or \$17.29 a month for 36 months.
  - (f) \$900.00 cash, or \$157 a month for 6 months, or \$82 a month for 12 months, or \$57 a month for 18 months, or \$44 a month for 24 months, or \$31.13 a month for 36 months.
3. Draw up a schedule to indicate the charges in problem 2.
4. What is included in the carrying charges?
5. Draw up a list of finance companies in your area. Visit them or write to them to obtain their pamphlets.
6. Cut out of your daily newspapers the advertisements for loan companies. Write down the radio jingles used for advertising the loan companies.
7. Write out the details of a family purchase.
8. Visit a store offering goods for sale on credit terms and obtain a copy of their agreement.

## SECTION 2    Types of Customer Accounts

Almost all retail stores offer their merchandise on a charge or deferred payment basis. Figure 6-1 indicates some of the differences and similarities between the charge account, the deferred payment account, and the revolving budget account.

**Figure 6-1                      Types of Customer Accounts**

<i>Charge Account</i>	<i>Deferred Payment (Budget)</i>	<i>Revolving Budget</i>
1. Purchases charged by identification card or charge plate.	Same	Same
2. No down payment required.	Retailer may require a minimum deposit of 10%. (Mandatory in Quebec).	No down payment except possibly when account first opened.
3. Full amount due 10 days after statement of purchases for month presented.	Fixed payments over definite number of months.	Sliding scale of minimum monthly payments determined by balance outstanding on account.
4. Interest charged on overdue accounts.	Interest and service charges included in monthly payment (determined by deducting cash price from total of monthly payments and deposit).	Interest and service charges on sliding scale (determined by balance of previous month).
5. Price paid is the same as for paying cash.	Price paid is cash price plus fixed interest and service charge.	Price paid is cash price plus variable interest and service charge dependant on monthly payment remitted.

### Charge Accounts

It is usually a simple matter to open a charge account. You make application and sign a simple agreement stating that you will conform to the terms of the settlement. You are then given a number and some form of identification such as a card or charge plate. Married women must give their husband's name and occupation. Minors must give their father's name and occupation, and usually obtain their consent. In Canada, persons under age 21 (minors) may open a charge account without parental consent if they have held one permanent position for a minimum period of six months; under six months, the consent of the father must be obtained and his name and occupation filled in when the agreement is completed.

When shopping in the store, you present this identification, and,

instead of paying cash, the amount of the purchase is charged to your account, and you sign the bill. At the end of the month, or on the same day of each month if the store operates a rotating billing system, you will receive a statement of the amount owed by you. Duplicates of the purchases' payments and credit slips for the month will be enclosed with your bill for you to check. Your bill must be paid within ten days of the billing date. If you do not pay your bill in the prescribed time, you are liable to an interest charge.

### Deferred Payment or Budget Accounts

Sometimes when you are purchasing a large item you may wish to pay for it over a period of time, and you may, in most stores, purchase both personal articles and household appliances on the instalment plan. Some stores stipulate that a down payment must be made, but others do not require it except in Quebec, where, if there is a conditional sales agreement to be signed, there must be a down payment. A carrying charge is then added to the balance and this amount is divided by the number of months over which the payments are to be spread.

*Example:* Mrs. Chesterton purchased a dining-room suite for \$550 on which she paid a 10% down payment. The balance, plus a service charge of \$74.25, was to be paid in equal monthly payments for the next eighteen months.

(a) What was the credit price?

(b) How much per month did Mrs. Chesterton have to pay?

Purchase of furniture	\$550.00
Down payment, 10%	<u>55.00</u>
Balance due	\$495.00
Carrying charge	<u>74.25</u>
Total amount due	<u><u>\$569.25</u></u>

(a) Credit price:

$$\$55.00 + \$569.25 = \$624.25$$

(b) Monthly payment:

$$\frac{\$569.25}{18} = \$ 31.63$$

### Revolving Budget Accounts

A revolving budget account combines the conveniences of a charge account and of a deferred payment or budget account. It is like an open deferred payment account whereby any purchases you make



are added to the amount owing, and payment of the resulting balance is spread over a number of months.

To open this type of account, you make an initial purchase and charge it. On the usual billing date you will receive a bill showing how much you owe and stating your minimum monthly payment. For example, you purchase \$70 worth of merchandise. When you receive your bill, it states the minimum monthly payment is \$6.00. If you pay \$70, the account becomes a straight charge account, and no carrying charges will be made. If you pay the minimum charge of \$6.00, your balance will then be \$64. The interest and service charge will be computed on the previous month's balance and added to this balance.

## WORKOUT EXERCISE II

1. Visit, or write, a large department store and ask for their literature on types of account they have available. What advantages and disadvantages do you think each type of account has for you?
2. Read again the business problem at the beginning of this chapter. How would you advise Mary Lewis?

## SECTION 3 The Carrying Charges

The carrying charges are found by comparing the amount that would be paid if the article were purchased for cash and the total that must be paid if the article is purchased on the instalment plan.

*Example:* The Tribune Appliance Store advertise the Tribune automatic washer and dryer for \$475 cash, or \$50 down and 24 monthly payments of \$22. (a) What is the credit price of the washer? (b) What is the carrying charge?

---

(a) Credit price:	
Down payment	\$ 50.00
24 payments of \$22	528.00
Total price	<u>\$578.00</u>

(b) Carrying charge:	
Credit price	\$578.00
Cash price	475.00
Carrying charge	<u>\$103.00</u>



The formulas for the credit price and for the carrying charges are:

$$\text{Credit price} = \text{Cash price} + \text{Carrying charges} \quad (1)$$

$$\begin{aligned} \text{Carrying charges} = & \text{Deposit} + \text{Total of periodic payments} \\ & - \text{Cash price} \end{aligned} \quad (2)$$

$$\text{or, Carrying charges} = \text{Interest} + \text{Service charge} \quad (3)$$

### WORKOUT EXERCISE III

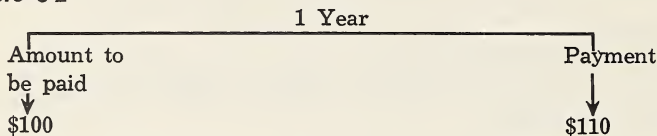
Find the credit price and the carrying charges for each of the following purchases:

1. Mattresses, \$37.95; \$6.00 per month for 7 months.
2. Electric range, \$189.95; \$10.00 per month for 24 months.
3. Four-speaker radio-record player \$88.95, 10% down, \$8.00 a month for 12 months.
4. Washing machine, \$228, 10% down, \$10 a month for 27 months.
5. Automatic dryer, \$154, 10% down, \$13.50 a month for 12 months.
6. Portable television, \$178, 10% down, \$8.25 a month for 24 months.
7. Mink stole, \$189, \$11.00 per month for 24 months.
8. Refrigerator, \$375, 10% down, \$22.50 a month for 18 months.
9. Stereo Hi-Fi, \$475, 10%, \$21.25 a month for 24 months.
10. 23" Console T.V., \$299, 10% down, \$18 a month for 18 months.
11. A movie camera is listed at \$250. It may be purchased on the instalment plan by making a down payment of \$30 and 24 monthly payments of \$12 each. Find (a) the carrying charges, (b) the credit price.
12. An electric refrigerator can be purchased for \$400 cash, or 10% down and 30 monthly payments of \$18 each. If you are at present purchasing 50 cents worth of ice each day, how much more will it cost you in 30 months to buy the refrigerator than to continue buying ice? When will the purchase of ice completely pay for the cost of the refrigerator? Do you consider it a good idea to buy the refrigerator in this case. Give reasons for your answer. Use a thirty-day month for calculations.
13. For problems 1 to 10 above, list the various factors which might make you decide to buy the listed articles on the instalment plan instead of paying cash for them. What qualities of the articles themselves would influence your buying?

## SECTION 4 The Rate of Interest Charged

Let us take a very simple case and assume we purchase an article worth \$100 for which payment is to be made in one year by one payment of \$110. We could picture our debt as in figure 6-2.

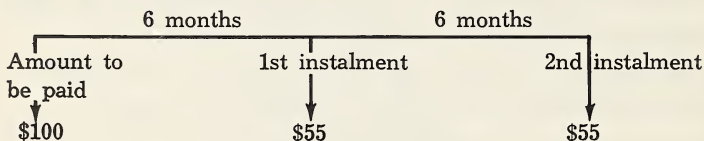
**Figure 6-2**



This would mean that we had the use of \$100 in credit for one year and then paid our debt plus 10% interest or carrying charge.

Let us assume again that we pay this debt in two instalments of \$55.00 at six-month intervals; we could picture our debt as in figure 6-3.

**Figure 6-3**



Again we have paid back \$110, but this time we only had the use of the \$100 for six months at which time we paid back \$55 (\$50 in principal and \$5.00 in carrying charges); and therefore in the second six months we only had the use of \$50 for which we paid the same \$55 instalment. In other words, we paid \$5 interest for \$100 for 6 months, plus \$5 interest for \$50 for 6 months.

By formula (see formula (4), Chapter 2), the rate of interest for the first six months is:

$$r = \frac{I}{Pt} = \frac{5 \times 100}{100 \times \frac{1}{2}} = 10\%$$

For the second six months:

$$r = \frac{I}{Pt} = \frac{5 \times 100}{50 \times \frac{1}{2}} = 20\%$$

The true rate of interest, therefore, lies somewhere between 10% and 20%. The mathematics involved in finding this true rate of interest is beyond the scope of this text, but we have a formula which

approximates very closely the true rate of interest. This formula is:

$$r = \frac{2NI}{P(n+1)} \times \frac{100}{1} \quad (4)$$

where  $r$  = rate of interest per annum,

$N$  = the number of payments per year,

$I$  = the difference between the total credit price and the cash price,

$P$  = the amount owed (purchase price less the down payment),

$n$  = total number of payments to be made.

Applying this formula to our problem, we find:

$$r = \frac{2 \times 2 \times 10}{100 \times 3} \times \frac{100}{1} = \frac{40}{300} \times \frac{100}{1} = 13.3\%$$

That is, the rate of interest, or carrying charge, amounted to approximately 13.3%.

*Note:* Care should be taken to assign the correct value to  $N$  when the number of payments to be made is for a period of less than one year. For example, if payments were to be made at monthly intervals for only five months, the value of  $N$  would still be 12. For three quarterly payments in nine months,  $N=4$ .

## WORKOUT EXERCISE IV

Calculate the rate of interest charged on each of the articles in problems 1-12, Workout Exercise III, using formula (4).

## SECTION 5 The Revolving Budget Account

### The Minimum Monthly Payment

As previously indicated, this type of account is an open deferred payment account to which goods can be charged before payment is completed on previous purchases. There is a minimum monthly payment based on the balance outstanding at the end of the month in which a purchase is made. These minimum payments are shown in figure 6-4.

For example, you purchase \$70 worth of merchandise, and your monthly payment is \$6.00. This monthly balance of \$6.00 will not change until either the account is paid up or another purchase is made. If another purchase is made, the balance on the next monthly statement is used to compute a new minimum payment.

**Figure 6-4 Monthly Payment Chart for Revolving Budget Account**

<i>Balance of Account</i>			<i>Minimum Monthly Payment</i>	
Up to	\$ 50	.....	.....	\$ 5.00
\$ 50.01 to	75	.....	.....	6.00
75.01 to	100	.....	.....	7.00
100.01 to	125	.....	.....	8.00
125.01 to	150	.....	.....	9.00
150.01 to	175	.....	.....	10.00
175.01 to	215	.....	.....	11.00
215.01 to	235	.....	.....	12.00
235.01 to	255	.....	.....	13.00
255.01 to	275	.....	.....	14.00
275.01 to	295	.....	.....	15.00
295.01 to	315	.....	.....	16.00
315.01 to	335	.....	.....	17.00
335.01 to	355	.....	.....	18.00
355.01 to	385	.....	.....	19.00
385.01 to	405	.....	.....	20.00
over \$405		.....	.....	5%

**The Monthly Service Charge**

The interest charge is always computed on the balance at the end of the previous month.

*Example:* A \$6.00 minimum monthly payment is paid on an original purchase of \$70.00. Calculate the account balance for the first three months of payments.

Original purchase, 1st month		<u>\$70.00</u>
Balance end of first month		\$70.00
2nd month:		
Minimum payment	\$6.00	
less: Carrying charges on \$70.00	<u>1.05</u>	4.95
Balance end of 2nd month		\$65.05
3rd month:		
Minimum payment	\$6.00	
less: Carrying charges on \$65.05	<u>1.05</u>	4.95
Balance end of 3rd month		\$60.10
4th month:		
Minimum payment	\$6.00	
less: Carrying charges on \$60.10	<u>.90</u>	5.10
Balance end of 4th month		<u>\$55.00</u>

Figure 6-5 is a typical chart of service charges for revolving budget accounts.

When you open this type of account, the maximum amount of credit you are to be allowed must be established, and this is based on your ability to pay. Should you be unable to pay the monthly payments, you are liable to lose both the merchandise and the payments to date.

Some systems determine the maximum monthly payment you are able to make and then establish your credit at some multiple of this amount. For example, if the maximum you can pay per month is \$75, your credit ceiling may be established at twelve times this amount, or \$910. You cannot then let your monthly balance exceed this amount, or the privilege of using the account may be withdrawn.

**Figure 6-5 Monthly Service Charges For Revolving Budget Accounts**

<i>Amount of Balance</i>				<i>Service Charge</i>			
Balance up to	\$	5.00		\$	.10		
5.01 to		15.00			.15		
15.01 to		25.00			.30		
25.01 to		35.00			.45		
35.01 to		45.00			.60		
45.01 to		55.00			.75		
55.01 to		65.00			.90		
65.01 to		75.00			1.05		
75.01 to		80.00			1.15		
80.01 to		90.00			1.30		
90.01 to		100.00			1.45		
100.01 to		110.00			1.60		
110.01 to		120.00			1.70		
120.01 to		125.00			1.80		
125.01 to		135.00			1.90		
135.01 to		145.00			2.00		
145.01 to		155.00			2.15		
155.01 to		165.00			2.25		
165.01 to		175.00			2.40		
175.01 to		185.00			2.50		
185.01 to		195.00			2.65		
195.01 to		205.00			2.75		
205.01 to		215.00			2.85		
215.01 to		225.00			2.95		
225.01 to		235.00			3.05		
235.01 to		245.00			3.15		
245.01 to		255.00			3.25		
255.01 to		265.00			\$3.35		
265.01 to		275.00			3.45		
275.01 to		285.00			3.55		
285.01 to		295.00			3.60		
295.01 to		300.00			3.65		
300.01 to		310.00			3.70		
310.01 to		320.00			3.80		
320.01 to		330.00			3.85		
330.01 to		340.00			3.95		
340.01 to		350.00			4.00		
350.01 to		360.00			4.10		
360.01 to		370.00			4.15		
370.01 to		380.00			4.25		
380.01 to		390.00			4.30		
390.01 to		400.00			4.45		
400.01 to		410.00			4.60		
410.01 to		420.00			4.75		
420.01 to		430.00			4.90		
430.01 to		440.00			5.05		
440.01 to		450.00			5.20		
450.01 to		460.00			5.35		
460.01 to		470.00			5.50		
470.01 to		480.00			5.65		
480.01 to		490.00			5.80		
490.01 to		500.00			6.00		
500.01 to		1,500.00			1.2%		
Over \$1500					1.0%		

Some firms determine a credit ceiling simply by not allowing customers to owe more than a certain amount (such as \$300 or \$500) at any one time. This amount is usually set according to the firm's past

experience. In this system, a customer's charges are checked each time he buys. The firm would rather take the time to do this than allow its customers to charge more than they can pay for.

*Example:* In January, Mary Newcombe purchased a bedroom suite for \$500 on a revolving budget account. In April, she purchased a new suit, dress, shoes, and hat for a total of \$175. In June, she made a payment of \$225 instead of the minimum monthly payment. In July, she purchased a bathing suit for \$15, and a play suit and slacks for \$25.

If Mary Newcombe is billed on the last day of each month, show the monthly balance, monthly payment, and monthly service charge for the above purchases to August 31.

January 31, account balance		\$500.00
February: Minimum payment, figure 6-4	\$25.00	
Service charge on \$500, figure 6-5	6.00	19.00
Balance, February 28		\$481.00
March: Minimum payment	\$25.00	
Service charge on \$481	5.80	19.20
Balance, March 31		\$461.80
April: Purchases	\$175.00	
Service charge on \$461.80	5.50	
	180.50	
Minimum payment	25.00	155.50
Balance, April 30		\$617.30
May: Minimum payment	\$ 30.87	
(recalculated on balance of \$617.30, figure 6-4)		
Service charge on \$617.30	7.41	23.46
Balance, May 31		\$593.84
June: Payment	\$225.00	
Service charge on \$593.84	7.13	217.87
Balance, June 30		\$375.97
July: Purchases	40.00	
Service charge on \$375.97	4.25	
	\$ 44.25	
Minimum payment	30.87	13.38
Balance, July 31		\$389.35
August: Minimum payment (on balance of \$389.35)	\$ 20.00	
Service charge on \$389.35	4.30	15.70
Balance, August 31		<u>\$373.65</u>



**WORKOUT EXERCISE V**

Refer to figures 6-4 and 6-5 for the following problems.

1. Chrissie Jones purchased a fur coat for \$495 on a revolving charge account on August 17th. Draw up her account for September, October and November, assuming she made no further purchases in those months.
2. In December, Chrissie Jones bought a new dress for \$29.95, a pair of shoes for \$19.50, and some underwear \$10.25. She also bought Christmas presents worth \$63.00 and each month paid in \$10.00 more than her minimum balance. Draw up her account for January and February.
3. Jackie Campbell purchased in June a skin-diving suit for \$85.00 and an oxygen tank for \$110. In July she purchased miscellaneous skin-diving equipment for \$27.50, a bathing suit for \$15.00, and two summer dresses for \$12.95 each. In August she purchased slacks, shorts, sweatshirts, and a play-suit totalling \$31.45. Show the monthly balance, the minimum monthly payment, and the monthly service charges for the account submitted to Jackie Campbell from June 30 until September 30, assuming she pays her minimum balance each month.
4. Janet Rule opened a revolving budget account and made the following purchases: January: \$68.00, \$55.95, \$7.95, \$3.95, \$4.00; February: \$7.50, \$1.95, \$1.25, \$9.10; March: \$89.75, \$10.95, \$6.50; April: \$3.95, \$15.65, \$1.65, \$12.95, \$15.60. If Miss Rule is billed on the last day of each month, show the monthly balance, the monthly payment, and the monthly service charge from January 31 to May 31. In February and March Miss Rule paid \$15.00 more than the minimum payment.
5. Draw up a statement showing the monthly payments, the monthly service charge, and the monthly balance for the account of Carol Lomax from June 30 to October 31, assuming the following transactions took place on her revolving budget account:  
Purchases, June: furniture, \$568; summer clothes, \$98;  
July: sports clothes, \$54; shoes, \$35; cosmetics, \$12.95;  
August: winter coat, \$95; fur jacket, \$295; shoes, \$25;  
September: stationery supplies, \$19.50; hose, \$7.95; dress, \$39.50; coat, \$75.00; suit, \$69.95;  
October: none.  
Payments, July: \$25 more than minimum;  
September: \$45 more than minimum;  
October: \$45 more than minimum.

6. If Grace Crowley is able to pay \$35 a month on her revolving budget account and her credit is set at eight times this amount, for how many months will she be able to spend \$50 before she reaches her credit limit, assuming she pays the minimum monthly payment each month?

7. The credit limit for revolving budget accounts at the Great Lakes Department Store is nine times the agreed maximum balance. If you can afford to pay \$25 a month, for how many months could you purchase \$30 worth of merchandise before you reached your credit ceiling, assuming you pay the minimum monthly payments?

8. For how many months can George Appleby spend \$50 a month on his revolving budget account if his credit limit is \$400 and he pays the minimum monthly payment?

9. Discuss the advantages and disadvantages of the revolving credit plan. Compare with those of the instalment plan.

### The Rate of Interest On Revolving Budget Accounts

Looking back at figure 6-5, we observe that the service charge increases in jumps of five cents or multiples of five cents and that a specific service charge is made for a range of balances. If your account balance is the lowest figure in the range, your rate of interest for that month would be higher than if your balance was the top figure in the range. For example:

Balance \$5.01, charge 15¢, rate of interest	
per month .....	3%
per year .....	36%
Balance \$15.00, charge 15¢, rate of interest	
per month .....	1%
per year .....	12%

An approximation can be arrived at for any particular series of payments by using formula (4). For example, if a purchase of \$100 is made and paid off at the rate of \$7.00 per month without further purchases, it will be found that sixteen payments will be made (the sixteenth is a little less than \$7.00). Using formula (4):

$$\begin{aligned}
 r &= \frac{2NI}{P(n+1)} \times \frac{100}{1} \\
 &= \frac{2 \times 12 [(15 \times 7 + 5.50) - 100]}{100 \times 17} \times \frac{100}{1} \\
 &= \frac{2 \times 12 \times 10.50 \times 100}{100 \times 17} \\
 &= 14.81\%
 \end{aligned}$$

It is left as an exercise for the student to work out the sixteen payments in the same manner as is done in the previous example. The average rate of interest for these charges appears to be approximately 15% per annum. It should be pointed out, however, that although this represents an interest charge to the borrower, it is only partly interest income to the seller as he incurs additional clerical and accounting expenses when offering this credit service.

This type of account should also be used with discretion. As can be seen, one could be perpetually in debt; and, what is worse, your dollar has less than 90 cents spending value.

### WORKOUT EXERCISE VI

Calculate the rate of interest on the following revolving credit accounts which are paid off at the minimum rate per month. (Refer to figures 6-4 and 6-5.)

1. \$45                      2. \$55                      3. \$60                      4. \$65                      5. \$70

6-10. If the minimum monthly payment was doubled in each of the above cases, what would the rates of interest be?

11. If \$450 worth of furniture is purchased by Guy Havelock from the Greystone Home Furnishings, and if he repays \$50 a month instead of the minimum payment, what rate of interest will he pay?

## SECTION 6      Purchasing an Automobile

The family car has become a symbol of our way of life and our standard of living, and most young people dream that one day, in the not too distant future, they will have their own automobile. But automobiles are expensive to buy, expensive to operate, and expensive to maintain. Before purchasing an automobile, we should calculate just what it will cost us to own and operate. The cost of owning an automobile consists of two parts:

- (a) the initial cost of buying the car;
- (b) the expense of operating the car — which includes: gasoline and oil consumption, operator and owner licences, tire replacements, repairs, garage rental, insurance, depreciation, and loss of income on money invested. (Businessmen consider the loss of revenue an additional expense because if they refrain from buying the car they can invest the money and earn income from their investment.)

Apart from a house, a car is probably the major single purchase an individual will make, and he should therefore be aware of the

intricacies involved. The arithmetic is the same as for the customer accounts already studied. We should now be equipped to avoid the pitfalls which may confront us when purchasing an automobile.

When you have decided on the car you wish to buy, you must decide how you are going to pay for it. You can:

- (a) Pay cash for it.
- (b) Borrow money from a bank or a loan company, pay for the car with this cash, and then pay back the loan. If you are in a position to borrow money from a bank, this will probably be the cheapest method of financing the payment as the bank will charge only 6% interest. However, you must have collateral to borrow money in this way (see Chapter 5).
- (c) Finance the purchase through a finance company. It is estimated that more than 50% of the new cars sold are purchased on the instalment plan, through finance companies.

Let us assume that you have decided to buy a new car and have selected the model you wish to own. The list price of the car is \$3,146.36. You decide to make a down payment of \$1,000 and pay the balance in twenty-four monthly payments. You will be required to sign a conditional sale contract similar to the one shown in figure 6-6(a) and figure 6-6(b).

When the record of the transaction has been completed, including registration costs and insurance premium, you find your unpaid balance is \$2,146.36. Figure 6-8 gives a chart of carrying charges and monthly payments. To use the chart to find your monthly payments for your outstanding balance:

- (a) Look in the centre column to find the line on which your unpaid balance of \$2,146.36 is shown, i.e., 2,126-2,150. (See figure 6-7)

**Figure 6-7**                      **Carrying Charge and Payment**

Unpaid Balance	24 Months	
	Amount	Charge
↓	↓	↓
2,126 - 2,150 — — — — →	106 — — — — →	420

- (b) Look under the heading "24 Months" at the "Charge" column and follow down to the same line of unpaid balance of 2,126-

2,150. The figure 420 is the interest and service charge you have to pay; this is the price differential, \$420, and added to \$2,146.36 gives the time price or credit price balance which is \$2,566.36.

- (c) Under "24 Months" in the column "Amount per Month" on the same unpaid balance line of 2,126-2,150 you will find your monthly payment to be \$106.

### Figure 6-6 (a) Conditional Sale Contract, Front

CONDITIONAL SALE CONTRACT		19... (Date)		AVOID MISTAKE—FILL OUT COMPLETELY																	
Between... (City or Town) (County) (Province)		... (City or Town) (County) (Province)		Purchaser																	
And (Dealer's Name)		... (City or Town) (County) (Province)		Seller																	
<p>Purchaser (meaning all of Undersigned, jointly and severally) hereby purchases from the Seller (meaning Seller above named and its assignee) on the following terms and conditions, AND UPON THE TERMS AND CONDITIONS SET FORTH ON THE REVERSE SIDE OF THIS CONTRACT WHICH ARE INCORPORATED HEREIN BY REFERENCE AND MADE A PART HEREOF, and Purchaser acknowledges delivery, examination and acceptance of the following described Motor Vehicle (whether automobile, truck, tractor, trailer, motorcycle or farm equipment), herein called "Car", in its present condition, for the Total Time Price (sum of Items 2 and 8). Purchaser agrees to pay the Time Price Balance shown herein to the order of Seller at the office of Commercial Credit Corporation Limited at... in instalments as hereinafter provided, with interest thereon after maturity at 10% per annum, until the Total Time Price is paid in full.</p>																					
YEAR MODEL	NEW OR USED	MAKE	MODEL No.	TYPE OF BODY																	
SERIAL No.	MOTOR No.	LICENSE No.	IF TRUCK TONS CAPACITY																		
Car will be kept at No... (Street) (City or Town) (County) (Province)																					
Purchaser agrees not to remove the Car from the registration district in which said address is located without the written consent of Seller.																					
<b>RECORD OF TRANSACTION</b>			<b>IRREGULAR PAYMENTS</b> Payable in accordance with the Schedule below																		
1. Total Cash Sales Price including all taxes, accessories, extras (Transportation Charges of \$... included) \$ 2. Deduct: Down Payment: Trade-in: \$ Make _____ Year _____ Serial No. _____ Less Lien Owning (Lienholder) \$ Net Trade-in Allowance \$ Cash \$ Total Down Payment \$			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Amount</th> <th>Date Due</th> <th>Amount</th> <th>Date Due</th> </tr> </thead> <tbody> <tr><td>\$</td><td></td><td>\$</td><td></td></tr> <tr><td>\$</td><td></td><td>\$</td><td></td></tr> <tr><td>\$</td><td></td><td>\$</td><td></td></tr> </tbody> </table>			Amount	Date Due	Amount	Date Due	\$		\$		\$		\$		\$		\$	
Amount	Date Due	Amount	Date Due																		
\$		\$																			
\$		\$																			
\$		\$																			
3. Balance of Cash Sales Price \$ 4. Add: Insurance Premium \$ 5. Registration Costs \$ 6. Unpaid Balance \$ 7. Add: Time Price Differential \$ 8. Time Price Balance \$			<p>1. The title, ownership and right of property in and to the Car shall remain in Seller, until all amounts due hereunder or rearrangements thereof are fully paid in cash. The payment of any amounts due hereunder may be renewed or extended by Seller without passing title of the Car to Purchaser.</p> <p>2. The loss, injury or destruction of the Car shall not release Purchaser from the payment hereof. Purchaser agrees to obtain and keep in force fire, theft and collision insurance on the Car and other insurance requested by Seller. Such insurance shall be in form, amount, and written by an insurer satisfactory to Seller. If Purchaser fails to purchase any insurance requested by Seller, Seller, as a creditor of Purchaser, may purchase such insurance, at Purchaser's expense. If the cost thereof is not included in the Total Time Price, Purchaser agrees to pay the same to Seller, on demand. Purchaser hereby assigns to Seller the proceeds of all such insurance (including any refund of premiums) to the extent of the unpaid portion of the Time Price Balance, and directs any insurer to make payment directly to Seller and appoints Seller as Attorney in Fact to endorse any cheque or draft, and to apply such proceeds to the payment of instalments due or to become due hereunder.</p> <p>Purchaser represents that he has read both sides of this contract, and that it was completely filled in at the time of signing. Purchaser hereby acknowledges receipt of a true executed copy hereof. If the cost of Creditor Life Insurance is included in the Total Time Price, Purchaser designates the individual whose signature first appears as the person to be covered thereby.</p>																		
<b>FOR ALBERTA ONLY</b> 9. Aggregate of Price on Time Sale and All Costs Added thereto (herein called "Total Time Price") \$																					
<b>DEFAULT CHARGE:</b> Interest at rate of 10% per annum on any instalment in arrears. Attorney's fee of 15% of debt, if employed.																					
<b>MONTHLY INSTALMENTS</b> Payable in... monthly instalments of \$... and a final instalment of \$... the first instalment payable... (month) (day) (year) *and each successive instalment payable on the same day of each and every month thereafter until the Total Time Price is paid in full. *If no date is inserted in blank, the first instalment is payable one month from date of contract.																					
<b>DEALER'S ASSIGNMENT</b>																					
FOR VALUE RECEIVED, and pursuant to the Terms of Assignment shown on the reverse hereof, Undersigned hereby sells, assigns and transfers to Commercial Credit Corporation Limited, its successors and assigns, all of its right, title and interest in and to the above contract and the Car referred to therein, with power to take legal proceedings in the name of Undersigned or itself. Commercial Credit Corporation Limited, is hereby authorized to correct patent errors in said contract and all other papers executed, endorsed or assigned in connection therewith.																					
(Purchaser Sign Here) (Seal) (Purchaser Sign Here) (Seal) (Dealer Sign Here) (Seal)																					
Signed and sealed this... day of... 19... (Owner, Officer or Firm Member) (Seal)																					



Figure 6-6 (b) Conditional Sale Contract, Back

## TERMS AND CONDITIONS

- Purchaser agrees: To pay promptly all taxes and assessments upon the Car and/or its use or operation and/or on this contract; that all equipment, tires, accessories and parts shall become part of the Car by accession; not to sell, transfer or encumber the Car or this contract or use the Car for hire or illegally; to notify his landlord of the Seller's lien and produce to Seller written evidence of such notice; to keep the Car free from liens; that if any lien is placed on the Car, the Seller may pay the same, and Purchaser agrees to pay the same to Seller, on demand. Time is of the essence hereof. Any notices to Purchaser shall be sufficiently given if mailed to the above address of Purchaser. Purchaser warrants that the automobile traded in, if any, is free from any encumbrance other than noted herein, and breach of said warranty shall be a breach of this contract.
- Purchaser takes notice that this contract, together with Seller's title to, property in and ownership of said Car, are to be forthwith assigned and negotiated by Seller to Commercial Credit Corporation Limited, and when so assigned, shall be free from any claim which Purchaser may have against Seller. Purchaser hereby accepts notice of such transfer. All rights of Seller hereunder, including the right to receive payments, repossess and any other privilege or right, shall vest in Seller's assignee. All payments or other monies due hereunder shall be paid by Purchaser to Seller's assignee without any right of offset in Purchaser, and any payments otherwise made shall be at the risk of Purchaser, if not received by Seller's assignee.
- If Purchaser defaults on any obligation under this contract, or if any proceeding in bankruptcy, receivership or insolvency be filed by or against Purchaser, or, if Seller should deem itself or the Car insecure, the unpaid portion of the Time Price Balance shall, without notice, at the option of Seller, become due forthwith. Purchaser agrees in any such case to pay said amount to Seller, upon demand, or, at the election of Seller, to deliver the Car to Seller. Seller, or any sheriff or officer of the law, may, without notice or demand for performance or legal process, lawfully enter any premises where the Car may be found, and take possession of it. Seller may retain all payments made by Purchaser as compensation for the use of the Car

while in Purchaser's possession. Any personal property in the Car at the time of repossession may be temporarily held by Seller for Purchaser, without liability therefor. Seller may sell the Car at private or public sale (at which Seller may be the purchaser), in accordance with the laws of the place where such sale is made. The proceeds of any such sale, less all expenses, shall be credited on the amount payable hereunder; Purchaser shall pay any remaining balance forthwith as liquidated damages for the breach of this contract, and shall receive any surplus.

6. Any action to enforce payment hereunder or any indulgences or rearrangements granted the Purchaser shall not be a waiver of or affect any rights of Seller. Any action brought on this contract may be commenced, and the place of trial, at the election of the Seller or its assignee, shall be in any Judicial District in which one of the offices of the Seller or assignee is located, in the Province in which the purchaser resides on the date of this contract. If the Purchaser fails to make any payments at maturity as herein provided, and the Seller is obliged to engage the services of legal counsel to enforce any of its rights herein, the Purchaser agrees to pay to the Seller an additional sum equal to 15% of the debt then remaining due, as a reasonable attorney's fee. All rights and remedies hereunder are cumulative and not alternative.

7. Where the Car is described on the reverse side hereof as used or second-hand, it is sold, and shall be deemed to have been sold, as second-hand goods.

8. Any part of this contract contrary to the law of any Province where used shall not invalidate other parts of this contract in that Province.

9. No conditions, warranties or representations, express or implied, statutory or otherwise have been made by Seller, unless noted hereon. This contract constitutes the entire agreement between the parties and no waivers or modifications shall be valid unless written upon or attached to this contract. Seller is hereby authorized to correct patent errors in the contract.

10. This contract shall be binding upon the heirs, executors and administrators of the Purchaser.

## TERMS OF DEALER'S ASSIGNMENT

Dealer warrants that the contract on the reverse side hereof is genuine and in all respects what it purports to be; that the name and residence of the Purchaser shown in the contract are true and correct; that the Purchaser is over 21 years of age and competent; that the contract is legally enforceable against the Purchaser named therein; that the down payment made by the Purchaser, stated in the contract, is the actual amount thereof, made in cash and not its equivalent, unless otherwise noted in the contract; that no part of the down payment was, to the knowledge of the Dealer, borrowed by the Purchaser, or was loaned to the Purchaser directly or indirectly by the Dealer or anyone connected with the Dealer; that Dealer has complied with all laws in respect to the sale of the Car; that Dealer had title to the Car, at the time of execution of the contract, free and clear of all encumbrances; and

that all obligations of Dealer contained in the contract have been fully performed. Dealer makes said warranties for the purpose of inducing Commercial Credit Corporation Limited (hereinafter called "Commercial Credit") to purchase the contract, and if any such warranties should be untrue, Dealer shall buy the contract from Commercial Credit, upon demand, and will pay therefor the amount unpaid to Commercial Credit thereon, plus any and all costs and expenses paid or incurred by Commercial Credit in respect thereto, and said remedy shall be cumulative and not exclusive, and shall not affect any other right or remedy that Commercial Credit might have at law or in equity. Dealer agrees that Commercial Credit, by purchasing the contract, shall not be deemed to have assumed any of the obligations of Dealer thereunder which are executory.

## GUARANTY BY THIRD PERSONS

Undersigned, jointly and severally, guarantee the payment, when due, to any holder of the contract on the reverse side hereof of all amounts from time to time owing hereunder, and the payment, upon demand, of the entire amount owing therein in the event of default in payment by the Purchaser named therein. Undersigned waive notice of acceptance of

this guaranty, notice of any extensions in time of payment, notice of sale of any collateral and all other notices to which Undersigned may be entitled by law and agree to pay all amounts owing hereunder upon demand without requiring any proceeding against Purchaser.

..... (Seal)  
(Guarantor)

..... (Seal)  
(Guarantor, Owner, Officer or Firm Member)

## FOR USE IN ALBERTA AND SASKATCHEWAN ONLY

CANADA

PROVINCE OF .....

COUNTY OF .....

I, ....., of the .....

in the County or District of .....

in the Province of .....

make oath and say that:

(Occupation)

- I am (the agent of) the Seller, mentioned in a written agreement, a true copy of which is hereto annexed.
- Such copy of said written agreement truly sets forth the agreement entered into between the parties and the terms, conditions and effects thereof with respect to the personal chattels therein mentioned.
- The said agreement was entered into bona fide and for the purpose of securing unto the Seller payment in full of the amount therein mentioned as to be paid and not for the purpose of protecting the personal chattels therein mentioned against the creditors of the said Purchaser therein named, or of preventing such creditors from recovering any claims which they may have against said Purchaser.

SWORN before me at the ..... of .....  
in the County or District of ..... in the Province of .....  
this ..... day of ..... 19.....  
.....  
(Signature of Seller or Agent)

A Commissioner, etc.,





Figure 6-9 Chart of Typical Carrying Charges and Monthly Payments for Used Cars and Trucks

8 Months			10 Months			12 Months			15 Months			18 Months			24 Months		
Mon.	Pay't	Chge.	Mon.	Pay't	Chge.	Mon.	Pay't	Chge.	Mon.	Pay't	Chge.	Mon.	Pay't	Chge.	Mon.	Pay't	Chge.
28	19	22	24	190-150	15	30	15	33	53	84	43	105	551-560	37	125	29	167
30	21	23	26	151-160	13	32	16	35	54	84	44	106	561-570	38	126	30	169
32	22	24	27	161-170	20	33	17	36	55	86	45	107	571-580	38	127	30	171
34	23	26	28	171-180	21	34	18	38	56	86	46	108	581-590	39	128	32	172
35	23	27	29	181-190	22	35	19	39	57	87	47	109	591-600	41	130	32	174
37	25	28	30	191-200	23	35	20	40	58	87	48	110	601-610	41	131	33	174
12 Months			15 Months			18 Months			24 Months			30 Months			36 Months		
Mon.	Pay't	Chge.	Mon.	Pay't	Chge.	Mon.	Pay't	Chge.	Mon.	Pay't	Chge.	Mon.	Pay't	Chge.	Mon.	Pay't	Chge.
21	41	17	52	201-210	15	62	12	82	63	94	52	115	631-640	44	139	35	186
22	43	18	54	211-220	15	65	13	86	64	95	52	116	641-650	44	140	35	188
23	45	19	56	221-230	16	67	13	89	65	96	53	118	651-660	45	141	36	190
24	47	19	58	231-240	17	70	13	93	66	97	54	118	661-670	46	142	37	192
26	48	20	60	241-250	18	73	14	96	66	99	54	120	671-680	47	144	37	193
28	49	21	63	251-260	18	75	14	98	67	99	55	120	681-690	47	144	38	195
29	50	22	65	261-270	19	76	15	101	68	99	56	122	691-700	47	146	39	196
27	53	23	67	271-280	19	78	15	104	69	100	57	123	701-710	48	146	39	197
28	54	23	69	281-290	20	81	16	108	70	101	57	125	711-720	49	149	39	200
29	56	24	71	291-300	21	84	16	111	71	103	58	127	721-730	50	150	40	202
30	57	25	72	301-310	21	85	17	114	72	103	59	127	731-740	50	150	40	204
31	58	26	73	311-320	22	88	18	117	73	104	60	128	741-750	51	153	41	207
32	60	26	75	321-330	23	90	18	119	74	106	60	130	751-760	52	154	41	209
33	61	27	77	331-340	23	92	19	122	75	107	61	132	761-770	52	156	42	212
34	63	28	78	341-350	24	93	19	125	76	107	62	132	771-780	53	157	42	214
35	64	29	80	351-360	25	96	20	128	77	109	63	135	781-790	53	157	42	214
36	65	29	81	361-370	25	98	20	131	77	109	63	135	791-800	54	161	43	217
37	67	30	82	371-380	26	100	21	133	78	111	64	138	801-810	54	161	43	217
38	68	31	84	381-390	27	102	21	136	79	111	64	138	811-820	54	161	43	217
38	68	31	86	391-400	27	103	22	138	80	112	64	138	821-830	54	161	43	217
39	69	32	87	401-410	28	104	22	138	81	112	64	138	831-840	54	161	43	217
40	70	33	89	411-420	29	106	23	141	82	112	64	138	841-850	54	161	43	217
41	72	34	91	421-430	30	110	24	146	83	114	65	141	851-860	55	164	44	220
42	73	35	93	431-440	31	113	24	149	84	114	65	141	861-870	55	164	44	220
43	75	36	94	441-450	31	113	24	149	84	114	65	141	871-880	55	164	44	220
44	76	36	96	451-460	31	114	25	152	85	116	66	146	881-890	55	164	44	220
45	76	37	96	461-470	32	115	25	153	85	116	66	146	891-900	55	164	44	220
46	77	38	96	471-480	32	116	26	153	86	116	66	146	901-910	55	164	44	220
47	78	38	97	481-490	33	117	26	156	86	116	66	146	911-920	55	164	44	220
47	78	39	98	491-500	34	119	27	158	86	118	71	148	921-930	55	164	44	220
48	79	40	98	501-510	34	119	27	158	86	118	71	148	931-940	55	164	44	220
49	80	40	100	511-520	35	121	28	161	87	118	71	148	941-950	55	164	44	220
50	81	41	101	521-530	35	122	28	161	87	118	71	148	951-960	55	164	44	220
51	82	42	103	531-540	36	123	29	163	88	120	72	150	961-970	55	164	44	220
52	83	43	103	541-550	37	124	29	163	88	120	72	150	971-980	55	164	44	220
52	83	43	103	551-560	37	124	29	163	88	120	72	150	981-990	55	164	44	220
52	83	43	103	561-570	37	124	29	163	88	120	72	150	991-1000	55	164	44	220
52	83	43	103	571-580	37	124	29	163	88	120	72	150	1001-1010	55	164	44	220
52	83	43	103	581-590	37	124	29	163	88	120	72	150	1011-1020	55	164	44	220
52	83	43	103	591-600	37	124	29	163	88	120	72	150	1021-1030	55	164	44	220
52	83	43	103	601-610	37	124	29	163	88	120	72	150	1031-1040	55	164	44	220
52	83	43	103	611-620	37	124	29	163	88	120	72	150	1041-1050	55	164	44	220
52	83	43	103	621-630	37	124	29	163	88	120	72	150	1051-1060	55	164	44	220
52	83	43	103	631-640	37	124	29	163	88	120	72	150	1061-1070	55	164	44	220
52	83	43	103	641-650	37	124	29	163	88	120	72	150	1071-1080	55	164	44	220
52	83	43	103	651-660	37	124	29	163	88	120	72	150	1081-1090	55	164	44	220
52	83	43	103	661-670	37	124	29	163	88	120	72	150	1091-1100	55	164	44	220
52	83	43	103	671-680	37	124	29	163	88	120	72	150	1101-1110	55	164	44	220
52	83	43	103	681-690	37	124	29	163	88	120	72	150	1111-1120	55	164	44	220
52	83	43	103	691-700	37	124	29	163	88	120	72	150	1121-1130	55	164	44	220
52	83	43	103	701-710	37	124	29	163	88	120	72	150	1131-1140	55	164	44	220
52	83	43	103	711-720	37	124	29	163	88	120	72	150	1141-1150	55	164	44	220
52	83	43	103	721-730	37	124	29	163	88	120	72	150	1151-1160	55	164	44	220
52	83	43	103	731-740	37	124	29	163	88	120	72	150	1161-1170	55	164	44	220
52	83	43	103	741-750	37	124	29	163	88	120	72	150	1171-1180	55	164	44	220
52	83	43	103	751-760	37	124	29	163	88	120	72	150	1181-1190	55	164	44	220
52	83	43	103	761-770	37	124	29	163	88	120	72	150	1191-1200	55	164	44	220
52	83	43	103	771-780	37	124	29	163	88	120	72	150	1201-1210	55	164	44	220
52	83	43	103	781-790	37	124	29	163	88	120	72	150	1211-1220	55	164	44	220
52	83	43	103	791-800	37	124	29	163	88	120	72	150	1221-1230	55	164	44	220
52	83	43	103	801-810	37	124	29	163	88	120	72	150	1231-1240	55	164	44	220
52	83	43	103	811-820	37	124	29	163	88	120	72	150	1241-1250	55	164	44	220
52	83	43	103	821-830	37	124	29	163	88	120	72	150	1251-1260	55	164	44	220
52	83	43	103	831-840	37	124	29	163	88	120	72	150	1261-1270	55	164	44	220
52	83	43	103	841-850	37	124	29	163	88	120	72	150	1271-1280	55	164	44	220
52	83	43	103	851-860	37	124	29	163	88	120	72	150	1281-1290	55	164	44	220
52	83	43	103	861-870	37	124	29	163	88	120	72	150	1291-1300	55	164	44	220
52	83	43	103	871-880	37	124	29	163	88	120	72	150	1301-1310	55	164	44	220
52																	

### The 6% Discount Plan

Another plan that is used extensively for the purchase of new cars is called the 6% Discount Plan. Its name is derived from the fact that the dealer expects to discount your promissory note for the sale price of the car you purchase, at the bank rate of 6%. The name does not refer to the interest rate that you pay, which is considerably higher than 6%.

When you purchase a car through a finance company, do not be misled by the name of the plan that may be offered to you. Remember that the interest rate can only be determined by referring to the chart for that specific plan, and following the method of calculation shown in the preceding example.

*Example:* Assuming a car to be bought on the above terms, what rate of interest would you be paying?

$$\begin{aligned} r &= \frac{2NI}{P(n+1)} \times \frac{100}{1} \\ &= \frac{2 \times 12 \times 420 \times 100}{2146.36 \times 25} \\ &= 18.8\% \end{aligned}$$

### Buying a Used Automobile

The same safeguards should be taken and the same calculations made before buying a used car as before buying a new car.

If you decide to buy a used car, the carrying charges are usually somewhat higher. Figure 6-9 shows a typical chart of used car and truck carrying charges.

### Car Insurance

Car insurance is carried to insure against public liability, collision, fire, theft, and property damage. The rates vary with the car, the type of protection, the age of the operator, and the previous accident record. This phase of car ownership will be discussed in Chapter 12. Suffice it to say at this point that any person owning a car should carry adequate insurance.

*A word of warning:* If you use any type of credit, deal only with reputable firms and read every contract before you sign it. If you are in any doubt, a branch of the Better Business Bureau will give you further information and advice.

## WORKOUT EXERCISE VII

Refer to figure 6-8 and 6-9 for the following problems.

- ① Sam Jones drove his car 15,000 miles last year. His expenses are listed in the table below. Complete the record by calculating the unknown costs marked "XX". (In the "Cost Per Mile" column, bring the answers to four decimal places.)

Expenses	Cost Per Year	Cost Per Mile
(a) Depreciation	\$750.00	XX .0500
(b) Fixed charges:		
Insurance	270 36% of depreciation	XX .0180
Licences	27 10% of insurance	XX .0018
Rent of garage	120 16% of depreciation	XX .0080
Total fixed charges	<u>417</u> XX	<u>XX .0278</u>
(c) Variable charges:		
Gasoline	285 38% of depreciation	XX .0190
Oil	15 12½% of rent	XX .0010
Tires	59 20% of insurance	XX .0036
Repairs	108 40% of insurance	XX .0072
Miscellaneous	15 100% of oil	XX .0010
Total variable charges	<u>427</u> XX	<u>XX .0318</u>
Total annual car costs:		
(a) Depreciation	\$750.00 750.	XX .0500
(b) Total fixed charges	XX 417.	XX .0278
(c) Total variable charges	XX 427.	XX .0318
Total costs	<u>XX 1644.</u>	<u>XX .1096</u>

- ② Harry Lane drove his car 12,500 miles last year. His depreciation and fixed charges were the same as for Sam Jones in problem 1. His annual variable charges varied according to the mileage; i.e., the more miles covered, the proportionately more gasoline used. Prepare a table similar to that in problem 1 to show Lane's cost per year and cost per mile of operating his car. What do you notice about the fixed costs per mile and about the variable costs per mile? Explain.

- ③ Polly Pratt purchased a new red and white four-door sedan which was listed at \$3,990. She was allowed \$1,790 on her old car. If she paid the balance in eighteen equal monthly payments: (a) What was the carrying charge? (b) What was her monthly payment? (c) What rate of interest did she pay?

a) \$325.  
b) \$139.  
c) 18.67%



4. Helen Ivers pays \$2,000 down on a new continental sports car costing \$4,560. If she pays the balance in twenty-one months, how much will she be required to pay each month, and what rate of interest will she be paying for this credit?
5. Paul Secord traded his old car, on which he was allowed \$1,480, for a new convertible costing \$3,765. If he paid the balance in twelve monthly instalments, what were his monthly payments? What was the rate of interest on the unpaid balance?
6. Constance March purchased her first used car which cost her \$2,540. If she made a 20% down payment and paid the balance in twenty-four equal monthly payments, how much were her monthly payments? What rate of interest did she pay?
7. Ronald Renter purchased a used panel truck for \$2,316 on which he paid a 25% down payment. He paid the balance in eighteen equal monthly payments. How much was the carrying charge; the monthly payment; the rate of interest?
8. Paul Reme purchased a used two-door sedan for \$1,975 on which he made a down payment of 15%. If he paid the balance in twenty-four monthly payments, how much a month did he pay? What rate of interest was he charged?
9. Frank Billings traded his two-year-old family car for a new special hard-top priced at \$4,760. He was allowed \$2,176 on his old car. He also purchased a small used second car from the same dealer for \$1,560, on which he made a 10% down payment. If he paid the balance of both cars in twenty-four months, how much was his total monthly payment? What rate of interest did he pay on the combined purchase? *20.4%* *used 73*  
*new 128*
10. Tom Follet Sales Agency traded six of their salesmen's cars for new models. The new cars were priced at \$3,150 each, and an allowance of one-third of this value was allowed for each trade-in. In addition, a used car valued at \$1,975 was purchased for general office use on which a 15% down payment was made. If the balance was paid in twelve equal monthly instalments, how much was the total monthly payment, and what rate of interest did they pay on the balance?

Show both actual figures and percentage figures in the graphs you draw for problems 11 and 12.

11. Draw a pie graph of the cost of owning and operating Sam Jones' car in problem 1; including, in addition to operating expenses, monthly payments of \$135.

12. Draw a pie graph to show the breakdown of the cost of owning and operating Harry Lane's car in problem 2; including, in addition to the expenses listed, monthly payments of \$121.

## SECTION 7     Figuring for Fun

1. Tom, Dick, Harry, James, and Pat were admiring Graham's new car.

"How many miles per gallon do you get from your car?" they inquired.

"How many would you guess?" replied Graham.

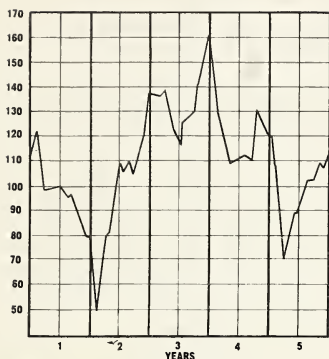
The boys guessed 18, 21, 23, 26 and 29 miles per gallon. Harry's guess was 6 out, Pat's 2 out, Dick's 4 out, James' 9 out, and Tom's 1 out. How many miles per gallon did Graham get in his new car, and how much did each boy guess?

2. In 1954 Roger Bannister of Great Britain broke the world's record for the one-mile by running it in 3 minutes 59.4 seconds. If you had been pacing him in a car, how many miles per hour would you have been driving? In the same year Bannister's record was broken by John Landy of Australia who ran the mile in 3 minutes 58 seconds. How many miles per hour would you have been driving if you had been pacing Landy?

3. What is the smallest number of cars that can drive in the following formation: two cars behind a car, two cars in front of a car, and a car between two cars?



NEW HOUSES BUILT IN LAST FIVE YEARS  
(In thousands of units)



SOURCE: D.B.S. (Adapted)

# Purchase and Sale of Real Estate 7

## A Business Problem

Max Morrison wishes to purchase a house valued at \$25,000 but has insufficient cash to make the purchase. A conventional 7%, 25-year mortgage can be obtained for 60% of the value. He can pay \$5,000 in cash by selling securities which give him a 5% return on his money. To raise the balance of the payment, he has been offered a 25-year, 8% second mortgage for \$5,000 on which he must pay a 70% bonus. He can also obtain a loan for \$10,000 at 10% interest in lieu of the second mortgage and the sale of his securities. Which method would be most advantageous for Max Morrison?

## SECTION 1 To Rent or To Buy

Shall I buy a house or rent an apartment or a house? This is a question that is asked at least once by every family, and to answer it many things must be taken into consideration.

An estimate of the cost of owning a house should be obtained and this compared to the cost of renting a home. To rent a house or apartment, the total rent is known and fixed. To purchase a house, the purchaser must find money for the initial down payment and have sufficient regular income to cover such expenses as: assessments, taxes, insurance, maintenance and repairs, replacements, depreciation, interest on mortgage, repayment of mortgage, interest on investment (consider the possible earnings if the investment in the home were instead placed into sound securities).

There are also other considerations. Do you like the neighbourhood? Is it new and growing, or old and becoming rundown? Is it

convenient to schools, churches, shopping areas, and entertainment? Are there good transportation facilities to work and to school?

There are many financial advantages to home ownership. It is a good form of security and a forced method of saving money. When you put a down payment on a house, you own that proportion of the whole value; but, as you meet the mortgage payments, you put more money into the house, and build up your "equity" in it. When the mortgage is fully paid, you own the house free and clear; and if the value of your house goes up or *appreciates* over the years, you will have made a good investment. Apart from the financial advantages, owning your own home gives you pride of ownership and greater freedom of enjoyment. On the other hand, if you cannot keep up the payments on the home, you may lose it together with the cash you have put into it. This may happen because:

- (a) You had insufficient funds with which to purchase the house;
- (b) You purchased a home beyond your financial means; (A measuring stick of how much you should pay is  $2\frac{1}{2}$  times your annual income; and the monthly carrying charges of mortgage payments and taxes should not exceed 2% of your gross annual income.)
- (c) You lost your job or other source of income;
- (d) You purchased a house that needed expensive repairs.

### Interest on Mortgage

The approximate average interest payable on the mortgage can be found as follows:

- (a) Divide the value of the mortgage by the number of payments. This gives the final balance due immediately before the last payment is made.
- (b) Add the beginning balances to the final balance and divide by 2. This gives the average amount of the mortgage due.
- (c) Multiply the average amount by the interest rate per payment.

*Example:* Henry Appleseed purchases a house on which he takes out a \$15,000, 6%, 25-year mortgage. What is his approximate average yearly mortgage interest?

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$$(a) \quad \frac{\$15,000}{25} = \$600 = \text{Final balance due}$$

$$(b) \quad \frac{\$15,000 + 600}{2} = \$7,800 = \text{Average of monthly mortgage}$$

$$(c) \quad \$7,800 \times .06 = \$468 = \text{Average yearly interest}$$

*Example:* Henry Appleseed is renting a house for \$175 a month. He can purchase the house for \$25,000 by paying \$10,000 in cash and signing a 6%, 25-year mortgage for the remainder. He estimates taxes will be \$425 per year, insurance \$75, maintenance and repairs \$200, depreciation and other expenses \$350. He will have to sell securities which are now earning 5% per annum to raise the \$10,000 down payment.

(a) Is it cheaper for Henry Appleseed to rent or buy the house?

(b) By how much per month?

(a) Yearly expenses:

Taxes	\$ 425
Insurance	75
Maintenance	200
Depreciation, etc.	350
Interest on mortgage, from previous example	468
	<u>1,518</u>

Loss of income from sale of securities:

5% of \$10,000 \$ 500

Total yearly expenses \$2,018

It is cheaper for Henry Appleseed to buy the house as total rental is \$2,100.

(b) Monthly rent \$175.00

Monthly cost of buying  $\frac{\$2018}{12} = \underline{168.17}$

Saving per month when purchasing \$ 6.83

Before reaching a decision in a problem such as the above, there is one other important consideration; namely, an individual, particularly the head of a family, may need to keep some of his assets in a liquid form (i.e., easily turned into cash), and may not wish to sell all his securities to purchase a non-liquid asset.

### WORKOUT EXERCISE I

1. Discuss the advantages and disadvantages of buying a house and of renting an apartment.
2. Under what circumstances might you lose your home and the equity in it?
3. Obtain as much literature as possible about "houses for sale" and "apartments for rent" from newspapers, real estate agents, etc.

4. Inspect some houses for sale in your district, preferably in a new development area, and obtain information about the purchase prices of the houses, what is being offered for the prices quoted — including any special inducements, and what means are being used to finance the payments.

5. Prepare a bulletin board from the information obtained in 3 and 4.

6. Tom Turner was married two years after he graduated from high school. He was then earning \$4,600 a year. His wife was earning \$3,100 a year and planned to work until their home was paid for. Approximately how much should Turner pay for a house? His annual expenses, including mortgage payments, should not exceed what amount?

7. The Turners decide on a house priced at \$18,500. Their savings amount to \$1,500, and their parents give them \$2,000 as part of the down payment. The balance is to be paid by signing a  $6\frac{1}{2}\%$  mortgage for 25 years. Taxes are estimated at 1.5% of the value of the house, insurance  $\frac{1}{6}$  as much as taxes, maintenance and repairs 0.7% of the value of the house, and depreciation 2% of the value of the house. What does their yearly expense bill amount to?

8. If the Turners are at present paying \$125 a month rent for an apartment, and are earning 6% per annum compounded monthly on their savings of \$1,500, which alternative will cost them more per month, continuing to rent an apartment or buying a house? How much more? What other considerations should be taken into account? Are the Turners within the limits set for them in problem 6?

Find the approximate average yearly interest on the following mortgages:

9. \$20,000, 6%, 20-year.

10. \$25,000,  $6\frac{1}{2}\%$ , 30-year.

11. \$30,000, 6% p.a. on monthly balance, where mortgage is paid off in monthly instalments over 10 years. (Note: 6% p.a. =  $\frac{1}{2}\%$  per month.)

12. \$27,000, 6% p.a. on quarterly balance, where mortgage is paid off in quarterly instalments over 15 years.

13. \$10,000, 9% p.a. on monthly balance, where mortgage is paid off in monthly instalments over 15 years.

14. \$35,000, 7% p.a. on half-yearly balance, where mortgage is paid off in semi-annual instalments over 20 years.

15. \$18,000, 8% p.a. on quarterly balance, where mortgage is paid off in quarterly instalments over 20 years.

16. Paul Bryan is paying \$95 a month rent for a house. The owner

of the house has offered to sell it to Bryan for \$15,000 cash. Bryan estimates taxes, insurance, maintenance, and depreciation will amount to \$975. To raise the \$15,000 cash, he would have to sell securities on which he is earning  $4\frac{1}{2}\%$  p.a. interest. What would be the yearly expense of buying the house? Is it cheaper to rent or to buy the house?

## SECTION 2 Purchasing a House

Should you decide to purchase a house, you will have to decide whether to build a new house or to buy a house already built.

### Building a House

Having a house built for you has the advantage that you may build it on land of your choice and to your own specifications. The costs involved will include cost of land, surveyor's fee, architect's fee, construction costs, and landscaping costs.

The contractor may undertake to build the house either for a set contract price or on a "cost-plus" basis. On a cost-plus contract, the builder submits a bill for all labour and materials and adds an agreed percentage to this total cost for his own services.

*Example:* Bert Fowler purchased a lot for \$4,000 in a new development area. It was surveyed for \$78. An architect drew plans to his specifications for \$550. He retained a building contractor to build the house on a cost-plus-10% basis. The contractor's bill for labour and material totalled \$28,195. A landscaper charged \$875 to landscape the grounds.

(a) How much was the builder's fee?

(b) What was the total cost of the house including landscaping?

(a) The builder's fee was:

10% of \$28,195	\$ 2,819.50
-----------------	-------------

(b) Total cost of house:

Land	4,000.00
Surveyor's fee	78.00
Architect's fee	550.00
Labour and material	28,195.00
Builder's fee	2,819.50
Landscaping fee	875.00
Total cost	<u>\$36,517.50</u>



### Buying a House Already Built

Both new houses and old houses may be bought already built. The land on which the house that is for sale stands is included in the purchase price. The land and the building(s) on it are considered as one unit and called *real estate*.

Real estate is usually purchased through licensed agents called *real estate brokers*. Both buyers and sellers avail themselves of the services of the brokers, and the brokers endeavour to bring the buyer and seller together to their mutual satisfaction. For this service, brokers receive a commission which is paid by the seller of the property, not the purchaser. The commission charged ranges from 4% to 10% depending on the type of property, the location of the property, and the type of *listing* desired. An *exclusive* listing with one broker in a large centre may cost 4% of the sale price; whereas a *multiple* listing with a group or board of realtors in the same centre may cost 5%. Sometimes, with the multiple listing, there will also be a photographic service. The pictures of houses for sale will be listed with a group of brokers in order that prospective buyers may look them over and visit only the houses in which they are interested. The brokerage rates charged in smaller centres will be somewhat higher than in large urban centres, with the rate for the sales of summer properties sometimes being as high as 10%.

### WORKOUT EXERCISE II

1. What steps are usually necessary in order to build a house to your own specifications?
2. What procedure would you follow to buy a house already built?
3. Saul Dryden purchased a piece of property for \$4,500 on which he proposes to build a house. He estimates that he will incur the following expenses: surveyor's fee, \$58; architect's plans, \$30; incidental legal fees, \$75; landscaping, \$295; contractor's labour and material supplies on a cost-plus-12% basis, \$14,785. What is the total estimate of the cost of the house and land?
4. Saul Dryden sells \$8,000 of securities, which bring in an income of 5% p.a., in order to finance the building of the house in problem 3. When the house is partially completed, he takes out a  $6\frac{1}{2}\%$ , 25-year mortgage for \$9,000 and pays the balance in cash. How much is left to pay in cash? What is the total cost of the house and land? (To the cost found in problem 3 add the lost income on investment and the mortgage interest charge. Find the average yearly charge and multiply it by the number of years the mortgage interest is paid.)
5. If Saul Dryden is at present paying \$110 a month to rent an

apartment, how much a month more or less will it cost him to pay for his house if he has the additional expenses of taxes, insurance, maintenance, and depreciation, which total \$725 a year?

Find the actual cost of each of the following houses. (The first entry has been worked out for you as an example.)

		Quarterly Average				
Value	Down Payment	Mortgage Due	Interest P.A.	Payments For	Mortgage Due	Actual Cost
\$20,000	\$ 5,000	\$15,000	6%	25 years	\$7,575	\$31,362.50*
6. \$30,000	\$10,000	XX	6½%	30 years	XX	XX
7. \$25,000	\$ 7,500	XX	6¼%	20 years	XX	XX
8. \$27,500	\$12,800	XX	6¾%	25 years	XX	XX
9. \$18,500	\$ 3,500	XX	7¼%	15 years	XX	XX
10. \$16,900	\$ 3,000	XX	6½%	20 years	XX	XX

\* \$20,000 + (\$7,575 × .015 × 100)

Find the proceeds of the sale of the following houses:

Value	Realtor's Commission	Value	Realtor's Commission
11. \$75,000	4%	16. \$98,150	6%
12. \$95,000	4½%	17. \$17,480	6¼%
13. \$15,364	4¾%	18. \$350,653	7¾%
14. \$21,420	5%	19. \$54,100	8½%
15. \$150,500	5½%	20. \$29,177	9¾%

21. Prestige Homes Limited agreed to build a house for Walter Stone on a cost-plus-12% basis on a plot of land Stone purchased for \$4,500. Costs were estimated to be as follows: excavation, \$125 a day for 5 days; concrete contractors and materials, \$2,100; bricklayers and materials, \$5,800; carpenters and lumber, \$8,420; plastering and painting, \$7,425; plumbing and heating, \$7,244; electric wiring and fixtures, \$2,745; roofing, \$2,917; incidental expenses, \$1,132. In addition, architect's fees were estimated at \$750 and landscaping at \$890. What was the estimated total cost of the house?

SECTION 3 Mortgages

Once the important decision has been made to build a house or to buy a house already built, it will be necessary to finance the purchase. Most people, even people who can afford to do otherwise, will finance the purchase of their home with a down payment of cash

and a mortgage to pay the balance. A *mortgage* is the "making over" of property in exchange for a loan of money on the understanding that when the debt is paid, the grant is void. In other words, the individual borrows money and gives the lender certain legal rights to the property should he fail to repay the loan when due.

Mortgages are of two general types: the *conventional* mortgage which is available on both new and old houses, and the *National Housing Act* (N.H.A.) mortgage which is only available on new homes (and for home improvements to existing homes).

The borrower is called the *mortgagor* and the lender is called the *mortgagee*.

### Conventional Mortgages

Life insurance and trust companies usually offer this type of mortgage, and the interest rates vary according to local and general conditions, but average about 7%. The life of a conventional mortgage is usually five years and can be renewed for five-year periods. Not more than 60% of the appraised value of the land and building(s) may be mortgaged.

*Example:* Mr. Edward Lott purchased a house for \$32,500. He obtained the maximum allowable 5-year mortgage from the Provincial Trust Company and paid the balance in cash. The terms of his mortgage were 7% interest, payable quarterly, with the option to repay 10% of the principal owing at the end of each year.

(a) What was the amount of the mortgage?

(b) If Mr. Lott adhered to the rule given as to the amount he should pay for a house, what was his annual income?

(c) Assuming he takes advantage of the repayment option, what was the amount of the quarterly interest in each of the five years?

(d) If the mortgage was renewed for a further 5 years, what would be the amount of the principal?

(a) Maximum allowable mortgage

$$60\% \text{ of } \$32,500 = \underline{\underline{\$19,500}}$$

(b) \$32,500 should be  $2\frac{1}{2}$  times his annual income.

$$\text{Annual income} = \frac{32,500}{5} \times \frac{2}{1} = \underline{\underline{\$13,000}}$$

(c) Quarterly interest:

1st year:

$$7\% \text{ of } \$19,500 = \$1,365$$

$$\text{Quarter's interest} = \frac{\$1,365}{4} = \underline{\underline{\$ 341.25}}$$

2nd year:

$$\text{Principal} \quad \$19,500$$

$$\text{less 10\% repayment} \quad \underline{1,950}$$

$$\underline{\underline{\$17,550}}$$

$$7\% \text{ of } \$17,550 = \$ 1,228.50$$

$$\text{Quarter's interest} = \frac{1,228.50}{4} = \underline{\underline{\$ 307.12}}$$

3rd year:

$$\text{Principal} \quad \$17,550$$

$$\text{less 10\% repayment} \quad \underline{1,755}$$

$$\underline{\underline{\$15,795}}$$

$$7\% \text{ of } \$15,795 = \$ 1,105.65$$

$$\text{Quarter's interest} = \frac{1,105.65}{4} = \underline{\underline{\$ 276.41}}$$

4th year:

$$\text{Principal} \quad \$15,795.00$$

$$\text{less 10\% repayment} \quad \underline{1,579.50}$$

$$\underline{\underline{\$14,215.50}}$$

$$7\% \text{ of } \$14,215.50 = \$ 995.085$$

$$\text{Quarter's interest} = \frac{995.085}{4} = \underline{\underline{\$ 248.77}}$$

5th year:

$$\text{Principal} \quad \$14,215.50$$

$$\text{less 10\% repayment} \quad \underline{1,421.55}$$

$$\underline{\underline{\$12,793.95}}$$

$$7\% \text{ of } \$12,793.95 = \$ 895.5765$$

$$\text{Quarter's interest} = \frac{895.58}{4} = \underline{\underline{\$ 223.89}}$$

(d) Amount of principal for new mortgage would be:

$$\text{Principal, beginning 5th year} \quad \$12,793.95$$

less 10% repaid end of

$$\text{5th year} \quad \underline{1,279.40}$$

$$\text{Amount of new mortgage} \quad \underline{\underline{\$11,514.55}}$$

Conventional mortgages are used most extensively throughout North America because there are few people who can lay out the cash value of real estate. Credit-buying is the major cause of this.

## WORKOUT EXERCISE III

90/1. State the maximum conventional mortgage allowable on the following properties: \$100,000; \$21,000; \$57,300; \$27,750; \$48,920; \$15,980; \$43,570.

Calculate the quarterly interest payments in the first year of a 7% per annum mortgage, interest payable quarterly, for the following mortgages:

2. \$55,000      4. \$560,000      6. \$49,120      8. \$27,900      10. \$113,700

3. \$18,500      5. \$25,600      7. \$501,000      9. \$11,500      11. \$89,500

12. If the mortgages in problems 2-11 represent the maximum conventional mortgage on the properties, what is the value of each property?

13. Mr. Anthony Regal purchased a house for \$25,000 on which he obtained a  $6\frac{1}{2}\%$  p.a., 5-year conventional mortgage for the full amount permissible. The interest was payable quarterly with the option to repay 8% of the principal owing each year. If Mr. Regal exercised this option, what quarterly interest would he pay each of the five years? If the mortgage was renewed at the beginning of the sixth year, what principal would be owing?

14. Ken French took out a  $7\frac{1}{4}\%$  p.a., 5-year conventional mortgage for the maximum permissible amount on his house valued at \$35,000. He paid the interest every quarter and at the end of each year exercised his option to repay 12% of the principal outstanding. Draw up a statement showing the quarterly interest he would pay in each year and the amount of the principal that would be outstanding if he renewed the mortgage at the beginning of the sixth year.

15. Tom Tracker obtained a 7% p.a. conventional mortgage for 50% of the value of his \$50,000 house. The interest was payable quarterly, and he had an option to repay 10% of the principal at the end of each year. What quarterly interest would he pay each year if he exercised his repayment option? What principal would be outstanding at the beginning of the sixth year?

16. Joy Gaylord obtained a  $6\frac{1}{2}\%$  p.a. conventional mortgage for the maximum allowable amount on her house valued at \$18,500. If she paid her interest quarterly and exercised an option to repay 9% of the principal at the end of each year, how much interest did she pay each quarter in each of the first five years, and how much was the outstanding principal at the beginning of the sixth year?

17. If each of the home owners in the last four problems followed the rule given as to the amount each should pay for a house, what would be each person's income?



18. Guy Lovelace purchased a triplex for \$50,000 on which he obtained a maximum 7% p.a. mortgage. He rented each of the three apartments for \$105 a month. In addition to the interest of the mortgage, his other expenses were: taxes, \$2,100; insurance, \$250; repairs and maintenance, \$517; heating, \$910; electricity, \$175; depreciation, 5%; miscellaneous, \$195. He sold securities paying 5% p.a. income to pay the balance of the purchase price. What was his total income and total expense for the first year? What was his profit or loss?

19. The use of mortgages follows roughly the same rules as credit-buying (discussed in Chapter 6). List the advantages and disadvantages of using mortgages.

### National Housing Act (N.H.A.) Loans

The money for a N.H.A. mortgage comes from lending institutions such as Central Mortgage and Housing Corporation and banks, but the government guarantees the repayment and so insures the lender against loss. Because of this, mortgage money is made more available. The interest rate at the time of writing may not exceed 6¾% and remains unchanged throughout the life of the mortgage. To repay the mortgage, monthly payments of principal and interest are made; in some cases, the monthly payments include taxes. Various limitations are placed on the size of the mortgage allowed. Some of these are that the mortgage cannot exceed 95% of the first \$12,000 of the appraised value of house and land, plus 70% of the remainder, up to a maximum of: \$14,200 for a house with 3 bedrooms, or less; \$14,900 for a house with 4 bedrooms, or more.

The life of N.H.A. mortgages is usually 25 years, although 35-year mortgages may be obtained by people in low income brackets by making a written request.

A 1960 amendment to the National Housing Loan Regulations allowed an additional \$500 if a fallout shelter was built by the mortgagee of the house, and \$1,000 for a duplex.

*Example:* Gordon Samson wished to purchase a new house at a cost of \$16,500. The house contained four bedrooms. What is the maximum N.H.A. mortgage he could obtain?

The maximum N.H.A. loan obtainable:

On first \$12,000: 95% of \$12,000	=	\$11,400
On remaining \$4,500: 70% of \$4,500	=	3,150
Maximum amount of mortgage		<u>\$14,550</u>

**WORKOUT EXERCISE IV**

State the maximum N.H.A. loan obtainable in the following cases:

- |  |  |
|--|--|
| 1. \$15,000, 2-bedroom                                 | 2. \$16,000, 4-bedroom   |
| 3. \$18,000, 3-bedroom                                 | 4. \$18,000, 4-bedroom   |
| 5. \$21,000, 3-bedroom                                 | 6. \$21,000, 5-bedroom   |
| 7. \$12,500, 1-bedroom                                 | 8. \$16,750, 2-bedroom   |
| 9. \$15,895, 2-bedroom                                 | 10. \$13,575, 1-bedroom  |
| 11. \$17,425, 4-bedroom and<br>fallout shelter (\$500) | 12. \$19,460, 4-bedroom duplex with<br>fallout shelter (\$1,000) |

**Second Mortgages**

It sometimes happens that the down payment and the maximum mortgage obtainable will not cover the cost of the home to be purchased. In this case the purchaser may arrange a *second mortgage*. However, should the purchaser default in his second mortgage payments, the holder of the first mortgage has the prior claim against the property, and the mortgage he holds must be fully paid before the holder of the second mortgage receives any payment. Persons willing to lend money on the security of a second mortgage therefore expect a higher rate of interest to compensate them for the greater risk they take.

This additional interest may be quoted as a per cent; for example, a 13%, 5-year second mortgage. But the more usual method is to quote the interest at a more nominal interest rate and charge a bonus.

*Example:* Hilda Jones purchased an older house valued at \$21,000.

She obtained a 5-year, 7% conventional mortgage for the maximum of \$12,600, and made a cash down payment of \$5,000. To obtain the additional \$3,400, she arranged an 8%, \$5,800, 5-year second mortgage. What yearly interest did she pay on the second mortgage? What per cent interest did she pay on the actual money borrowed?

Yearly interest:	8% of \$5,800	=	\$464
Actual interest:			
on \$3,400		=	\$464
on \$ 100	$= \frac{464}{3400} \times \frac{100}{1}$	=	13.7%

This rate of 13.7% is usually closer to the interest rate charged than is the rate quoted for the mortgage. People seeking second

mortgages should investigate the terms and bonus payment requirements very carefully before borrowing money in this way.

### WORKOUT EXERCISE V

What per cent interest would be paid on the following second mortgages?

1. 8%, \$16,000, which paid \$9,000 in cash.
2. 7%, \$11,125, which paid \$6,100 in cash.
3.  $7\frac{1}{2}\%$ , \$12,500, which paid \$7,200 in cash.
4.  $8\frac{1}{2}\%$ , \$35,000, which paid \$22,000 in cash.
5. 6%, \$14,420, which paid \$6,600 in cash.
6.  $6\frac{1}{2}\%$ , \$13,830, which paid \$6,900 in cash.
7. 8%, \$21,000, which paid \$12,500 in cash.
8. 9%, \$18,960, which paid \$13,120 in cash.
9.  $7\frac{1}{2}\%$ , \$15,375, which paid \$8,870 in cash.
10.  $8\frac{1}{4}\%$ , \$17,500, which paid \$10,500 in cash.
11. Terrance Murray purchased a \$27,000 house on which he made a down payment of \$5,000. He obtained a  $6\frac{3}{4}\%$ , 5-year conventional mortgage for the maximum amount and an 8%, 5-year second mortgage to cover the balance for which he paid a bonus of \$4,100. Both mortgages require the interest to be paid quarterly and have an option to repay 10% of the principal at each year end. (Calculated on the face value of the mortgage.) How much would the total quarterly interest payment be on the two mortgages in the first two years if the repayment option is exercised? What rate of interest is paid on the value received for the second mortgage?
12. Gordon Scott made a \$7,500 cash down payment on a \$25,000 house. He arranged a conventional 5-year,  $7\frac{1}{4}\%$  mortgage for the maximum amount obtainable. To cover the balance, he obtained a  $7\frac{1}{2}\%$ , 5-year second mortgage on which he paid a 75% bonus. What quarterly interest payment would he make during each of the five years if the interest on both mortgages was payable quarterly and he exercised an option to pay 10% of the principal outstanding at the end of each year?

### Equal Repayments of Principal and Interest

If the interest and principal are to be paid off in instalments, the law requires that this must be computed in advance. This is called *amortizing* the mortgage. Table 3 at the back of the book shows a \$7,000 mortgage loan with interest at  $6\frac{1}{2}\%$  amortized over 15 years

with 12 payments a year. The monthly payment is \$60.65, and this payment consists of the interest due on the principal outstanding plus a repayment of principal. The amount of the required monthly payment is computed from annuity tables, and is beyond the scope of this text. Figure 7-1 shows an amortization schedule.

**Figure 7-1**                      **Amortization Schedule**

*\$10,000 loan at 7% per annum, computed semi-annually  
over 20 years. 40 semi-annual payments of \$468.27*

(1) Payment Number	(2) Total Payment	(3) Interest 3.5% of balance of (5)	(4) Principal Repaid (2) — (3)	(5) Balance of Loan
				\$10,000.00
1	\$468.27	\$350.00	\$118.27	9,881.73
2	468.27	345.86	122.41	9,759.32
3	468.27	341.58	126.69	9,632.63

*Explanation:* 7% per annum compounded semi-annually is 3.5% per half-year payment period. Semi-annual payment is \$468.27 from annuity tables.

The first payment consists of:

- (a) 3.5% interest on \$10,000 for one six-month period = \$350, (column 3).
- (b) As only \$350 of the payment of \$468.27 is required to pay the interest on the outstanding loan, the balance of \$468.27 — \$350, or \$118.27, is used to repay part of the loan (column 4). The balance of the loan owing is now: \$10,000.00 — \$118.27, or \$9,881.73 (column 5).

The second payment consists of:

- (a) 3.5% interest on the balance of the outstanding loan of \$9,881.73 for one, six-month period = \$345.86 (column 3).
- (b) Total payment of \$468.27 minus interest payment of \$345.86, or \$122.41, is available to repay the loan (column 4). The balance of the loan owing is now \$9,881.73 minus \$122.41, or \$9,759.32 (column 5).

The third payment consists of:

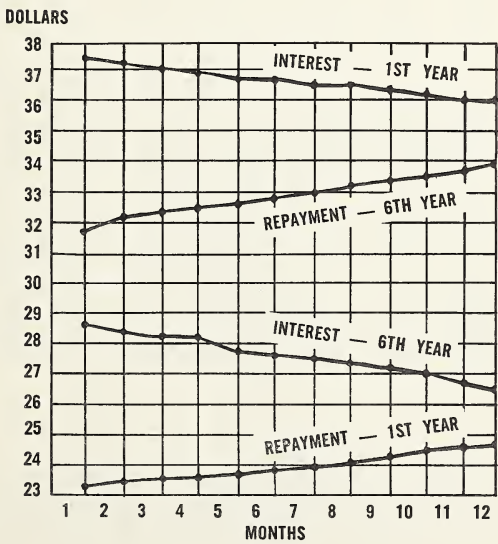
- (a) 3.5% interest on the balance of the outstanding loan of \$9,759.32 = \$341.58 (column 3).

(b) The difference between the total payment, \$468.27, and the payment of interest, \$126.69, is the repayment of the loan = \$126.69 (column 4). The balance of the loan owing at the end of the third year, after the third payment, is \$9,632.63.

It can be seen therefore that as the outstanding loan is reduced, the interest payment on the balance becomes less; and as the total payment is always constant, the repayment portion of the payment increases. An examination of Table 3 at the back of the book will illustrate this. The first payment is divided as follows: interest, \$37.41; loan repayment, \$23.24. The 180th payment is divided: interest, 32¢; loan repayment, \$59.13.

This can also be illustrated graphically as in Figure 7-2, which shows the interest and repayment breakdown of the monthly payment for the first and sixth years.

**Figure 7-2**  
**Comparison of First Year and Sixth Year**  
**Breakdown of Monthly Payment**





As previously mentioned, mortgage loans are usually amortized by monthly payments. To find the required monthly payment, one must have a knowledge of annuities which is acquired when studying investment mathematics. However, as this information is frequently required, the statisticians have drawn up tables to show the monthly payment necessary to amortize any loan with durations ranging from two to twenty-five years at all the common rates of interest. Figure 7-3 is a section of such a table when the interest on the mortgage is  $6\frac{3}{4}\%$ , compounded semi-annually. Interest compounded semi-annually is called for by the National Housing Act and is generally used in computing mortgage interest. A more complete table for monthly payments when interest is  $7\%$ , computed semi-annually, will be found at the back of the book. (See Table 4.)

**Figure 7-3      Monthly Payment Necessary To Amortize  
a Loan At  $6\frac{3}{4}\%$**

Term	18	19	20	21	22	23	24	25
Amount	years	years	years	years	years	years	years	years
\$ 5600	44.56	43.35	42.28	41.32	40.46	39.69	39.00	38.37
5700	45.35	44.12	43.03	42.06	41.18	40.40	39.69	39.05
5800	46.15	44.90	43.79	42.79	41.91	41.11	40.39	39.74
5900	46.94	45.67	44.54	43.53	42.63	41.82	41.09	40.42
6000	47.74	46.45	45.30	44.27	43.35	42.53	41.78	41.11
6500	51.72	50.32	49.07	47.96	46.96	46.07	45.26	44.53
7000	55.70	54.19	52.84	51.65	50.58	49.61	48.74	47.96
7500	59.67	58.06	56.62	55.34	54.19	53.16	52.23	51.38
8000	63.65	61.93	60.39	59.03	57.80	56.70	55.71	54.83
8500	67.63	65.80	64.17	62.71	61.41	60.24	59.19	58.23
9000	71.61	69.67	67.94	66.40	65.02	63.79	62.67	61.66
9500	75.59	73.54	71.72	70.09	68.64	67.33	66.15	65.08
10000	79.56	77.41	75.49	73.78	72.25	70.87	69.63	68.51
15000	119.34	116.11	113.23	110.67	108.37	106.31	104.45	102.76
20000	159.12	154.81	150.97	147.56	144.49	141.74	139.26	137.01

*Example:* Don Adams purchased a house for \$25,000 on which he obtained a  $6\frac{3}{4}\%$  conventional mortgage for the allowed maximum. If he amortized this mortgage by monthly payments of interest and principal over 21 years, how much a month did he pay?

Maximum conventional mortgage:

$$60\% \text{ of } \$25,000 = \$15,000$$

From figure 7-3

Term	18	19	20	21
Amount				
—				
—				
—				
—				
15,000				110.67
—				
—				
—				

Find the amount of the mortgage in the left-hand column, i.e., \$15,000.

Follow this amount horizontally to the column headed 21 years, and this figure will be the required monthly payment for 21 years, i.e., \$110.67.

$$\text{Required monthly payment} = \$110.67$$

## WORKOUT EXERCISE VI

1. Continue the schedule in figure 7-1 for the next three semi-annual payments. Draw a graph to show these first six payments of interest and repayment of loan, (figure 7-2).
2. Draw up an amortization schedule for a loan of \$12,500 at 6% per annum, compounded quarterly, for the first year's payments. Payments of \$254.10 are made quarterly.
3. Draw up an amortization schedule for a loan of \$15,000 at 5% per annum, compounded semi-annually, for the first three payments. Payments of \$597.54 are made half-yearly.
4. Draw up an amortization schedule for the first two years on a loan of \$35,000 at 7½% per annum, compounded semi-annually. Payments of \$1,580.16 are made semi-annually.
5. Continue the schedule in problem 3 for three more payments and draw a graph to show the breakdown of the first six monthly payments (figure 7-2).
6. Draw a multiple bar chart to show the breakdown of the first payment in the 1st, 6th, and 11th years from Table 3.

7. Draw a component bar chart to show the breakdown of the 12th, 36th, 60th, 84th, and 108th payment from Table 3.

8. Draw a multiple bar chart and a component bar chart to show the breakdown of the last payment in the 3rd, 6th, 9th, and 15th year from Table 3.

From figure 7-3 and Table 4 find the monthly payment to repay each of the following mortgages:

<i>Mortgage</i>	<i>Interest</i>	<i>Term</i>	<i>Mortgage</i>	<i>Interest</i>	<i>Term</i>
9. \$ 5,900	6¾	19 years	15. \$ 6,500	6¾	25 years
10. \$ 1,600	7	25 years	16. \$ 7,300	7	23 years
11. \$ 9,100	7	18 years	17. \$ 5,500	7	21 years
12. \$ 3,900	7	24 years	18. \$15,000	7	18 years
13. \$19,000	7	22 years	19. \$ 2,600	7	20 years
14. \$ 8,500	6¾	21 years			

20. Grant Dennis had a house built to his specifications. The costs were: land, \$5,300; excavation, \$625; concrete contractors and materials, \$2,100; bricklayers and materials, \$5,800; carpenters and lumber, \$8,420; plastering and painting, \$7,425; plumbing and heating, \$7,244; electric wiring and fixtures, \$2,745; roofing, \$2,917; incidental expenses, \$1,132; architect's fees, \$750; landscaping, \$890. Builder's costs (from the excavations to the incidental expenses) were subject to a cost-plus-12% charge. He took out the maximum allowable 7% conventional mortgage (rounded to the nearest thousand dollars) and a 7% second mortgage for one-third this amount on which he had to pay a 70% bonus. Both mortgages were for 25 years and repayable in monthly instalments. He paid the balance in cash. What was the total cost of the house? How much was the first mortgage? The second mortgage? The down payment? What was the monthly payment on each mortgage? What was the interest charge on the amount received for the second mortgage?

## SECTION 4                      Sale and Lease-Back

Since the end of the Second World War, another type of real estate contract, called sale and lease-back, has become big business in Canada, spreading here from the United States and Europe. In a sale and lease-back agreement a company sell their real estate assets to an investor or an investment company with an agreement to lease it back from the purchaser for a definite number of years. The rental will provide the investor with a good return on his invested money and will repay the purchase price of the real estate

during the life of the lease.

The majority of supermarkets, chain stores, oil companies, and large manufacturing concerns do not own the buildings they occupy but rent them on some type of a lease-back arrangement. There are two methods of arranging this:

(a) The company itself finances the building of a new plant and, upon completion, sells it to a finance company and immediately leases it back. They may also sell an existing building in order to raise money for other purposes and then lease it back from the purchaser.

(b) The finance company will finance the construction of the entire property on the basis of a long-term rental agreement. A contractor may often make these arrangements and offer a package deal to the company.

The first or original lease usually extends for twenty or more years and frequently carries an option to renew at a reduced rate, possibly one-third of the original rent. The terms of the lease generally require the company, now the tenant, to pay all operating expenses in connection with the proper maintenance of the property, keep the property fully insured, and pay the taxes on it.

Management must now ask: Shall we buy and own our buildings or shall we lease them? This depends on a number of things including:

(a) The credit rating of the company. If this is good it will be possible to pay a reasonably low rate of interest on the money invested in the building. If the interest rate charged is too high, it will be better to own the buildings. The finance companies, as a rule, are only interested in the larger companies. One rough basis of measurement is that the net worth (total assets — total liabilities) of the borrowing company must be twice the value of the building, and the company must have shown a profit for the last three years.

(b) A company that is expanding its business will need money with which to purchase merchandise inventory for manufacture or resale and may not have available cash to tie up in fixed assets, such as buildings.

Income tax benefits accrue to the company as rent paid is a deductible expense. This aspect of sale and lease-back will be considered more fully in Chapter 11.

## WORKOUT EXERCISE VII

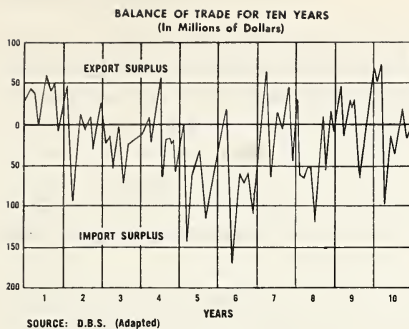
1. Describe two methods of a sale and lease-back arrangement.
2. What type of companies frequently use the sale and lease-back method?

3. Who is responsible for the maintenance of the property, for keeping it fully protected by insurance and paying the taxes on it?
4. What circumstances would influence management in their decision to buy property or lease? Can you think of reasons other than those given?
5. What approximate size should a company be before a finance company would be interested in financing a lease-back? If the proposed building is worth \$100,000, what would be the net worth of the company? What is one possible way this could be made up?
6. The Pennypinchers Discount House is to open a new outlet near the city of Pineville. The new store is expected to cost \$1,000,000. Triumph Investments Ltd. will finance the building and charge a yearly rental of \$80,000 for the first 20 years with an option to renew for another 20 years at \$45,000 a year rent. The discount house could raise sufficient funds by issuing 40-year, 6% bonds. In order to repay the bonds, \$66,000 a year must be set aside. Which plan will cost the company less per annum?
7. The Peter Thorndyke Corporation sold their factory to an investment company for \$1,500,000 and leased it back at a yearly rental of \$115,000. They used the \$115,000 to enlarge their warehousing and selling facilities, an expansion which resulted in an increased net profit of \$150,000. How much did they gain the first year by their sale and lease-back agreement?

## SECTION 5     Figuring for Fun

1. You go to sleep at 8.00 o'clock tonight and set your alarm to waken you at 8.30 tomorrow morning. If you sleep soundly all the time, how many hours sleep will you have?
2. Last fall Andy Tremaine went hunting. One morning he set out from his camp and walked three miles due south. He turned, walked two miles due west, and came upon a bear. He shot the bear, concealed it, and walked three miles due north back to his camp to report his success. What colour was the bear?





## Foreign Exchange

# 8

### A Business Problem

Sportland Motors wish to open a foreign car sales room and are considering the following proposals for agencies for cars from:

(a) Germany: Price of car delivered in Canada, 7,600 D. marks. Terms, n/30. It is estimated that 20 cars a month could be sold at a markup of 25% on cost.

(b) England: Price of car delivered in Canada, Model A, £555. 2s. 6d; Model B, £710. 15s. 3d. Terms, 1/30, n/60. It is estimated that 10 Model-A cars a month could be sold at a markup of 22½% on the selling price, and 6 Model-B cars a month could be sold at a markup of 27½% on cost.

(c) Italy: Price of car delivered in Canada, 1,920,000 lira. Terms, ½/10, n/30. Estimated sales are 10 cars per month at a markup of 20% on cost.

(d) France: Franco Junior delivered in Canada would cost 6,510 new francs, and Franco Senior would cost 14,325 new francs. Terms, n/45. It is estimated that 16 Franco Juniors per month at a 27½% markup on cost and 6 Franco Seniors per month at a markup of 25% on selling price could be sold.

If only one agency can be handled by Sportland Motors, which agency would be the most profitable? Before making a final decision, what other matters should be taken into consideration?

Canada is the fourth largest trading nation in the world. Approximately one-fifth of the goods and services which are available to you have been imported into Canada from foreign countries; Canada exports approximately the same value to foreign countries. Our most important exports are: newsprint, lumber and wood pulp (37.51%); nickel, copper, etc. (19.56%); aluminum, asbestos, etc. (10.24%); wheat and coarse grains (14.20%); iron (4.08%); fish and animal products (3.53%); chemicals (2.50%); miscellaneous (8.38%).

The annual dollar value of these exports is in the neighbourhood of \$5,000 million; 60% of these exports go to the United States, 15% to Great Britain, and the remaining 25% to all other countries.

The value of the goods we import each year amounts to approximately \$5,500 million, of which 71% comes from the United States,

9% from the United Kingdom, and the remaining 20% from all other countries. These imports cover a wide range of goods, the most important being machinery, automobiles, automobile parts, petroleum, electrical appliances, iron and steel, fruit and textiles.

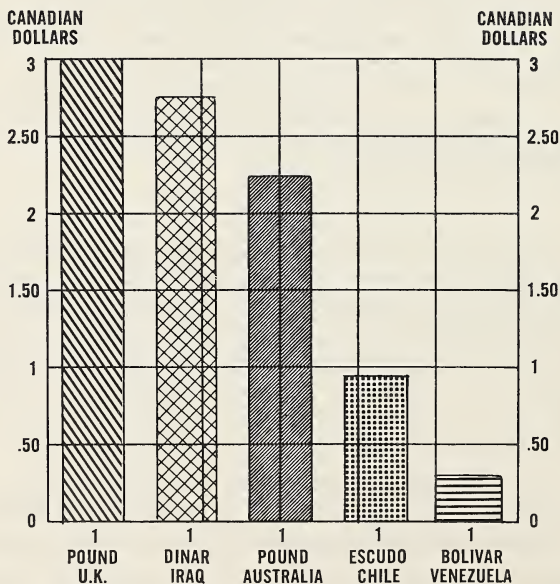
### WORKOUT EXERCISE 1

1. Draw a multiple bar graph comparing Canadian imports from and exports to the United States, the United Kingdom, and all other countries.
2. Assuming in one year our exports total \$5,000 million, calculate the dollar value of the exports named above to the nearest tenth of a million dollar.

## SECTION 1 Rates of Foreign Exchange

When goods are sold in or purchased from another country, payment must be made in the currency of the country of sale. However, in the case of trade between two countries, the buyer and the seller use different units of currency.

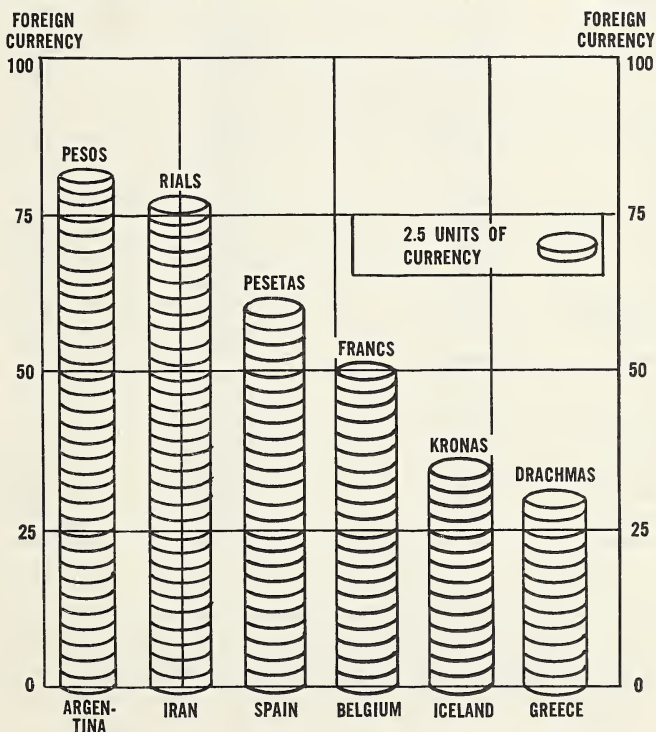
**Figure 8-1 Canadian Dollar Value of Foreign Currency**



For example: a Canadian exporter ships merchandise to a company in Italy for which he desires payment in Canadian dollars. The Italian firm uses lira, the currency of Italy, to make its purchases. The Italian company will then, through their bank, purchase Canadian dollars with which to pay the Canadian trader. A Canadian importer, on the other hand, must buy foreign currency to pay his bill to the foreign exporter. The bank, in each case, acts as middleman. The amount in dollars which must be paid for the foreign currency is the *rate of exchange*, as indicated in figure 8-1.

Figure 8-2, on the other hand, shows the amount of domestic money certain foreign countries must pay for one Canadian dollar.

**Figure 8-2 Price of One Canadian Dollar To Foreign Countries**



Since 1951 there has been free movement of money into or out of Canada so that the rate finds its own level through market forces; it fluctuates in accordance with demand for dollars and supply of dollars. An exception was the fixing of the Canadian dollar in terms of the American dollar on May 2, 1962, at  $92\frac{1}{2}\%$ . This was done to

stabilize the economy and increase imports. A recent table of rates is given in figure 8-3.

**Figure 8-3 Foreign Exchange Rates**

<i>Country</i>	<i>Unit</i>	<i>Canadian Dollar Equivalent</i>	<i>Units Per Canadian Dollar</i>
Argentina	Peso	0.01208	82.78
Austria	Schilling	0.03831	26.10
Australia	Pound	2.2343	0.4476
Belgium	Franc	0.02004	49.90
Brazil	Cruzeiro	0.004352	229.78
Burma	Kyat	0.2092	4.78
Chile	Escudo	0.9470	1.05597
Czechoslovakia	Koruna	0.1384	7.22
Denmark	Krone	0.1445	6.92
Ecuador	Sucre	0.6642	15.05
Finland	Markka	0.003113	321.23
France	New Franc	0.2032	4.92
Germany	D. (Deutsche) Mark	0.2339	4.18
Greece	Drachma	0.03321	30.11
Haiti	Gourde	0.1993	5.02
Iceland	Krona	0.02622	38.14
India	Rupee	0.2095	4.77
Iran	Rial	0.01315	76.03
Iraq	Dinar	2.7895	0.3583
Italy	Lira	0.001605	623.05
Japan	Yen	0.002763	361.27
Netherlands	Florin	0.2642	3.78
Norway	Krone	0.1395	7.17
Portugal	Escudo	0.03477	28.76
Spain	Peseta	0.01660	60.12
Sweden	Krona	0.1925	5.19
Switzerland	Franc	0.2315	4.32
Turkey	Lira	0.1107	9.03
United Kingdom	Pound	3.0185	0.3313
United States	Dollar	1.07875	0.92699
Venezuela	Bolivar	0.2976	3.36
Yugoslavia	Dinar	0.003321	301.11

*Example:* The Quality Plants Company of Manitoba imported from the Hansel Export Company of the Netherlands a hundred gross of tulip bulbs for which they received an invoice for 155 florins. To how much did the invoice amount in Canadian dollars?

$$1 \text{ florin} = \$0.2642$$

$$\therefore 155 \text{ florins} = \$0.2642 \times 155$$

$$\text{Invoice price} = \$396.30$$

*Example:* In January, the Alberta Pulp and Paper Company exported \$1,500 worth of newsprint to France. What would France pay for the newsprint in its own currency?

$$\$1.00 = 4.92 \text{ new francs}$$

$$\$1,500 = 4.92 \times 1,500 \text{ new francs}$$

$$= 7,380 \text{ new francs}$$

## WORKOUT EXERCISE II

1. Draw a graph similar to figure 8-1 to show the Canadian dollar value of 1 kyat (Burma), 1 new franc (France), 1 D. mark (Germany), 1 rupee (India), 1 florin (Netherlands), 1 franc (Switzerland).
2. Draw a pictogram similar to figure 8-2 to show the price of one Canadian dollar in Brazil, Finland, Japan, and Yugoslavia.
3. Draw a pictogram to show the price of one Canadian dollar in Burma, Czechoslovakia, France, Germany, Haiti, India, the Netherlands, and Venezuela.
4. Referring to figure 8-3, draw a graph to show the Canadian dollar value of 1 schilling (Austria), 1 sucre (Ecuador), 1 drachma (Greece), 1 krona (Iceland), 1 escudo (Portugal).

Give the Canadian dollar equivalent for the following invoices:

5. from Iceland: 5,783 kronas
6. from Yugoslavia: 37,128 dinar
7. from Iran: 928 rials
8. from Haiti: 482.3 gourdes
9. from Brazil: 12,819.7 cruzeiros
10. from Argentina: 1736.8 pesos
11. from Australia: 310 pounds
12. from Chile: 76.85 escudos

What would merchandise valued at \$1,325 (Canadian) be worth in the following countries:

13. Denmark
14. India
15. Italy
16. Japan
17. Portugal
18. Turkey
19. England
20. Chile.
21. Complete the following table by calculating the unknown values.

	Canadian Dollars	British Pounds Sterling	German D. Marks	Japanese Yens	Danish Kroner
(a)	100	—	—	—	—
(b)	—	200	—	—	—
(c)	—	—	500	—	—
(d)	—	—	—	10,000	—
(e)	—	—	—	—	1,000



## SECTION 2 Foreign Travel

If you wish to travel in another country, you will need to purchase the currency of that country with your Canadian dollars. This should be done before you leave Canada through your own bank. Instead of buying the currency and carrying a great deal of money with you, it is possible to purchase cheques, called *travellers' cheques*, which can be cashed at banks, hotels, restaurants, transportation offices, and many other places in any civilized country. They can be bought in small or large denominations and must be signed by the purchaser at the bank at the time of purchase and also at the time they are to be cashed. The bank charges a small fee for the service (1% for American travellers' cheques).

*Letters of credit* can also be obtained from the bank to be used by individuals or firms. Travellers for large firms usually use this means of financing their trip. A letter of credit is a document obtained from the bank which authorizes agents of the bank in any foreign country to pay the bearer certain sums of money up to the value of the credit shown. This also eliminates carrying large sums of money when travelling.

The document is in the form of a letter addressed to the bank's agent notifying them that the bearer, whom they name, can draw on a specified bank up to a specified amount. A separate letter is carried with a specimen signature. The inside pages of the letter contain a full record of the payments made to the bearer, the date, by whom paid, and the amount paid, written in both figures and words.

### WORKOUT EXERCISE III

How much is each of the following letters of credit worth in Canadian dollars:

- |                                |                                |
|--------------------------------|--------------------------------|
| 1. 114,829.60 yen              | 2. 84,079.8 bolivar            |
| 3. 738.5 gourdes               | 4. 2,357,962.18 Belgian francs |
| 5. 11,832.16 Argentinian pesos | 6. 91,217.18 pesetas           |
| 7. 107,025.23 Swiss francs     | 8. £1,389.16s.6d, Australian   |
| 9. 97,082 schillings           | 10. 796,831.75 markkas         |
11. The number of tourists visiting Belgium in each of the last ten years has been: 11,750; 17,825; 33,870; 59,870; 51,940; 61,990; 69,980; 78,840; 79,320; 93,970. Draw a line graph to show these visits.
12. If each tourist stayed an average of  $2\frac{1}{2}$  days in Belgium and spent an average of \$22.50 per day, how much revenue in francs per traveller would this bring to Belgium?

## SECTION 3 Newspaper Quotations

The rate of exchange is the value of the monetary unit of one country in terms of another country. The price at which foreign money can be bought and sold will vary from day to day and is published in the daily newspapers. Figure 8-4 is such a quotation.

Figure 8-4 A Newspaper Quotation Showing Foreign Exchange Rates

<p>U.S. dollar closed at a premium of 7 25/32 per cent in terms of Canadian funds yesterday in Toronto, down 1/32 per cent. Pound sterling closed at \$3.01½, down 1/8 cent. Noon rate for U.S. dollar was 107 25/32 per cent.</p> <p><b><i>Your dollar is worth . . .</i></b></p> <p>(Rates relative to the Cdn. dollar)</p>			
Argentina, peso	.0076	Israel, pound	.3591
Australia, pound	2.413	Italy, lira	.0017
Austria, schilling	.0429	Jamaica, pound	3.0165
Bahamas, pound	3.0165	Japan, yen	.0030
Belgium, franc	.0216	Mexico, peso	.0865
Bermuda, pound	3.0165	Netherlands,	
Brazil, cruzeiro	.0018	guilder (florin)	.2992
Chile, escudo	.5586	Netherlands West Indies,	
China, peoples dollar (yuan)	.4376	guilder (florin)	.5735
Columbia, peso	.1100	New Zealand, pound	3.005
Costa Rica, colon	.1626	Norway, krone	.1507
Czechoslovakia, crown	.1496	Pakistan, rupee	.2266
Denmark, krone	.1564	Panama, balboa	1.0781
Egypt, pound	2.4726	Peru, sol	.0413
Finland, markka	.3367	Philippines, peso	.2803
France, franc	.2200	Portugal, escudo	.0383
Germany (East)		Puerto Rico, dollar	1.0781
ost. deutschemark	.4849	South Africa, rand	1.510
ost. deutschemark	.2565	Spain, peseta	.0181
Germany (West)		Sweden, krona	.2076
deutschemark	.2711	Switzerland, franc	.2499
Great Britain, pound	3.0165	U.S.S.R., ruble (new)	1.197
Greece, drachma (new)	.0359	Venezuela, bolivar	.3226
Haiti, gourde	.2156	West Indies (except	
Hong Kong, dollar	.1889	Jamaica) dollar	.6284
Iceland, krona	.025	Yugoslavia, dinar	.0014
India, rupee	.2266		
<p>U.S. dollar 7½-7⅞ premium  Sterling in Canada 3.01¼-3.02¼  Sterling in N.Y. 2.79½-2.80½</p>			

Many circumstances and situations may affect the rates of exchange such as:

- Change in the balance of trade; i.e., the balance between the exports to and imports from the country. Gold and wealth tend to flow away from countries that must buy more than they sell.
- Political disturbances, unrest, or lack of confidence in the governments of foreign nations.
- Interest due by one country on the investments of another country.
- Inflation of a country's currency by excessive issue of currency.
- The competitive position of the two countries in the world's markets.

## The Dollar Area

Canada and the United States have the same monetary unit and form the major part of the "Dollar Area" or those countries trading in dollars. Rates are usually quoted in two ways:

(a) By stating the premium or discount on the American dollar over the Canadian dollar; for example, in figure 8-4 the U.S. dollar at the close of "yesterday's" business was at a premium of  $7\frac{2}{3}\frac{1}{2}\%$  in terms of Canada's dollar. This means \$1 American equalled  $\$1.07\frac{2}{3}\frac{1}{2}$  Canadian. This was  $\frac{1}{3}\frac{1}{2}\%$  higher than the day before.

(b) By stating the value of the dollar in America in terms of the dollar in Canada; for example, in figure 8-4 the U.S. dollar is quoted as worth  $107\frac{2}{3}\frac{1}{2}$  cents in Canadian currency.

## The Sterling Area

The "Sterling Area" includes those nations trading in the pound sterling (£), the chief of which is the United Kingdom. Their monetary system is:

£1 = 20 shillings, 20s.

1s. = 12 pence, 12d.

1d. = 4 farthings.

Referring to figure 8-4, we see that the pound sterling closed at  $3.01\frac{5}{8}$ , or that £1 =  $\$3.01\frac{5}{8}$  Canadian dollars. The range for £1 in Canada was  $3.01\frac{1}{4} - 3.02\frac{1}{4}$ ; the range for £1 in the United States was  $2.79\frac{5}{8} - 2.80\frac{5}{8}$ . These rates are approximately 7 shillings to the dollar.

*Example:* The Canada U-K Motors in Alberta received a shipment of 15 small cars from England invoiced at £555. 4s. 10d. each. If the exchange was  $\$3.01\frac{1}{2}$  per pound, how much must be paid in Canadian dollars for the shipment?

The America U-K Motors in New Jersey received a similar shipment. If the exchange was  $\$2.79\frac{3}{4}$ , how much in U.S. dollars would the importer have to pay?

Sterling value of shipment:

15 cars at £555. 4s. 10d. each

15 × 10d. = 150d. =

12s. 6d.

15 × 4s. = 60s. =

£3 — —

15 × £555 =

£8325 — —

£8328. 12s. 6d.

Bring the shillings and pence to a decimal fraction of £1.

1s. =  $\frac{1}{20} \times 1$  = £0.05

$$\begin{array}{rcl}
 12s. & = & 0.05 \times 12 & = & \text{£}0.6 \\
 6d. & = & 0.5 \times 0.05 & = & \text{£}0.025 \\
 & & & & \underline{\text{£}0.625}
 \end{array}$$

$$\therefore \text{£}8,328. 12s. 6d. = \text{£}8,328.625$$

(a) Payment in Canadian dollars:

$$\begin{array}{rcl}
 \text{£}1 & = & 3.01\frac{1}{2} & = & \$3.015 \\
 \text{£}8,328.625 & = & 3.015 \times 8,328.625 & & \\
 & & = & \underline{\underline{\$25,110.80}}
 \end{array}$$

(b) Payment in U.S. dollars:

$$\begin{array}{rcl}
 \text{£}8,328.625 & = & 2.7975 \times 8,328.625 \\
 & = & \underline{\underline{\$23,299.33}}
 \end{array}$$

Originally, most countries were on the "gold standard"; that is, the monetary unit of the country was a gold coin containing a certain gold content, and there was free movement of gold in and out of countries. The value of one country's currency in terms of any other country could only fluctuate within very narrow limits around the "par" or the "mint par" value of the gold unit of currency which was fixed by law. This limit was usually reached when it equalled the price of shipping gold from one country to the other.

Since World War II, however, the exchange value of the currency of many countries has fallen. Today the free movement of gold is subject to many government restrictions, and most countries are no longer on the gold standard. The United Kingdom gold piece is called a "sovereign" and is equal to 21 shillings and contains 113.001 grains of pure gold; the Canadian and United States gold dollar contains 23.22 grains.

$$\therefore 1 \text{ sovereign} = \frac{113.001}{23.22} = \$4.8665 \text{ Canadian or American dollars.}$$

*Example:* If there were a free movement of gold between England and Canada and England and the United States, and the exchange were at the mint par, what price would be paid in dollars for the shipments of cars in the previous example?

Payment in Canadian or U.S. dollars:

$$\begin{array}{rcl}
 \text{£}1.05 & = & \$4.8665 \\
 \therefore \text{£}8,328.625 & = & \frac{4.8665}{1.05} \times \frac{8,328.625}{1} \\
 & = & \underline{\underline{\$38,601.19}}
 \end{array}$$

**WORKOUT EXERCISE IV**

Use the rates shown in figure 8-4, except where otherwise stated.

1. Draw up a table to show the Canadian dollar equivalent of the rates of exchange quoted in figure 8-4 with another column for the rates quoted in figure 8-3, which applied approximately one year before figure 8-4. For each one indicate the change in rate and whether increased or decreased.
2. Look up the exchange rates in today's paper and draw up a table of comparison similar to that in problem 1 between the rates in figure 8-4 and today's quotations noting the percentage increase or decrease in each rate.
3. Oriental Cameras Limited import cameras from Japan. The invoice for the last shipment amounted to 4,786,123 yens. If the nominal rate given in figure 8-3 applied, how much in Canadian dollars is required to pay the invoice cost of Oriental Cameras Limited?
4. Animal Imports Limited import frozen lamb to British Columbia from Australia. The last shipment was invoiced to them at £3,217.15s. How much would this cost Animal Imports Limited in Canadian dollars?
5. Last year Norway imported textiles from countries other than Canada valued as given below. Calculate how much would be paid to each country in their own currency and the value of each country's shipment in Canadian dollars.

<i>Country</i>	<i>Millions of Kroner</i>
Germany	123.4
Britain	105.1
Netherlands	61.8
Sweden	46.2
Belgium	45.7
Denmark	35.7
France	32.3
Switzerland	22.5
Japan	19.1
Italy	18.9
United States	16.9

6. Draw a horizontal bar graph to show Norway's textile imports (in kroner).
7. Last year Canada exported to Norway the following textiles:



5,179 yd. of cotton at 41¢ a yard; 191,044 lb. of synthetic fibre at \$1.10 a pound; synthetic clothing at \$76.21; rags and waste at \$1,147; nets, twine and commercial fishing equipment at \$376,762; 8 cwt. felt at \$318 a hundredweight. What was the total cost in kroner to the Norwegian importers? Use figure 8-4.

8. Finer Imports Company, Winnipeg, imported from England the following china: 50 dinner sets at £30. 7s. 6d. a set; 25 luncheon sets at £10. 10s. 6d. a set; 75 starter sets at £3. 6s. 3d. a set; 1 gross teapots at £5. 3s. 9d. a dozen. If the exchange on £1 sterling was \$3.01¼, how much in Canadian currency would Finer Imports Company pay?

9. Compact Car Corporation, Victoria, British Columbia, imported from England in the first three months of the year the following cars: 20 cars invoiced at £815. 12s. 9d. each; 30 cars invoiced at £1,145. 7s. 6d. each; 42 cars invoiced at £928. 15s. 3d. each; 71 cars invoiced at £783. 1s. 6d. each. If the exchange for £1 sterling was \$3.02, how much did the Compact Car Corporation pay out in Canadian dollars for the cars they received?

10. Import Suitings Limited, Toronto, imported from England the following wool tweed suitings: 36½ yards at £1. 2s. 6d. a yard; 25¼ yards at 17s. 3d. a yard; 50¾ yards at £1. 1s. 6d. a yard; 75½ yards at 10s. 6d. a yard; 63 yards at 19s. 9d. a yard; 47¼ yards at £1. 1s. 3d. a yard. If the exchange for £1 sterling was \$3.01½, what was the total dollar value of the invoice?

11. Explain the term "balance of trade".

12. What are Canada's main exports? From the information at the beginning of the chapter find the dollar value of each of the exports listed.

13. What is a rate of foreign exchange? Give four examples of a Canadian having need of foreign currency.

14. List as many reasons as you can think of that would cause fluctuations in the value of the Canadian dollar.

15. What is meant by the dollar area and the sterling area? List as many countries as you can belonging to each area.

16. How is the mint par value derived? What is the mint par value of the pound sterling in terms of the Canadian and American dollar?

17. What were the effects, in terms of the Canadian rate of foreign exchange, of the devaluation of the Canadian dollar? List the sources you consulted to find the answer.

## SECTION 4      Payment to Foreign Countries

### By Bank Cheque

If an importer in Canada owes money to a foreign merchant, he can secure from a Canadian bank a cheque for the necessary amount of foreign currency. This will be drawn on a bank in the foreign country in which the Canadian bank has a deposit. The Canadian bank will charge the importer slightly more than the prevailing rate of exchange taking the difference as profit.

*Example:* Duchess Rugs Limited, Vancouver, have received an invoice from Kahn and Caspian of Teheran, Iran, for 150,000 rials. Duchess Rugs Limited secure a cheque from the Traders Bank of Canada drawn on the Iran National Bank in Teheran. If the Traders Bank of Canada charge Duchess Rugs Limited one-eighth of one per cent above the rate as shown in figure 8-3, how much did the cheque cost Duchess Rugs Limited?

1 rial	=	\$ .01315
150,000 rials	=	\$1,973.50
Bank charge $\frac{1}{8}\%$	=	2.47
Total cost		<u>\$1,974.97</u>

### By Bill of Exchange or Draft

A bill of exchange is a method of exchanging money of different units. Although bills of exchange are used in domestic trade, their more common use is for the payment of foreign debts. A bill of exchange is customarily drawn by the seller or exporter upon the buyer or importer. It is payable either at sight or within a stated number of days (30, 60, or 90) after acceptance by the buyer. Attached to the bill are the shipping papers. The exporter can then discount this bill at his home bank and obtain immediate payment for his goods.

*Example:* The Wells Car Company, Saskatoon, purchased from the X-3 Racer Car Company, England, a shipment of small cars invoiced at £12,617. 17s. 6d.; terms, n/90.

- How much would a draft dated January 13 cost to pay the bill?
- If the X-3 Racer Car Company discounted the draft on February 2nd at their local bank at 6% discount, how much did they receive in payment to the nearest penny?

$$(a) \text{ £1} = \$3.0185$$

$$\text{£12,617.875} = \$38,087.06$$

∴ The draft cost \$38,087.06 in Canadian funds.

(b) Discount charged by the bank:

Due date of draft: January 13 + 90 + 3 = April 16

Discount date: February 2

Number of days discounted: April 16 – February 2  
= 73 days

$$\frac{73}{365} \times \frac{6}{100} \times \frac{12,617.875}{1} = \text{£151.4145}$$

$$\begin{array}{r} \text{Proceeds:} \quad \text{£12,617.875} \\ \quad \quad \quad - \quad \quad \quad \text{151.4145} \\ \hline \quad \quad \quad \text{£12,466.4605} \end{array}$$

$$1\text{s.} = .05 \quad .45 = 9\text{s.}$$

$$1\text{d.} = .004167 \quad .0105 = 3\text{d. to nearest penny}$$

$$= \underline{\underline{\text{£12,466. 9s. 3d.}}}$$

## WORKOUT EXERCISE V

Use the rates given in figure 8-3.

If the following invoices were paid by cheque and the bank charged  $\frac{1}{4}\%$ , how much would each cheque cost the Canadian importer in Canadian funds:

- |                                 |                                   |
|---------------------------------|-----------------------------------|
| 1. England, £20, 2s. 6d.        | 2. Greece, 4,820.6 drachmas       |
| 3. Norway, 1,328.6 kroner       | 4. Italy, 19,843.71 lira          |
| 5. Yugoslavia, 21,047.84 dinar  | 6. Haiti, 6,784.72 gourdes        |
| 7. France, 21,043.12 new francs | 8. India, 39,872.88 rupee         |
| 9. Burma, 15,455.15 kyats       | 10. Venezuela, 46,832.77 bolivars |

Canadian exporters sent out the following invoices which were paid by cheque in Canadian funds. If the foreign importer was charged  $\frac{1}{8}\%$  by his bank, how much would he pay in his own currency for the Canadian cheque?

- |                            |                          |
|----------------------------|--------------------------|
| 11. Argentina, \$15,762.65 | 12. Scotland, \$7,829.84 |
| 13. Belgium, \$870.43      | 14. Austria, \$9,218.64  |
| 15. Turkey, \$732.16       | 16. Japan, \$27,483.51   |
| 17. Germany, \$11,035.57   | 18. Chile, \$8,373.77    |
| 19. Greece, \$8,321.24     | 20. Ecuador, \$19,847.48 |

21. Bob Hopper imported from Stereohifi Company, England, 7,125 stereophonic recordings invoiced at £1. 1s. 6d. each. He accepted a sixty-day draft drawn on him on September 22 which Stereohifi Company discounted at 6% at their bank on October 5. How much did Bob Hopper pay for the draft in Canadian funds if the exchange was \$3.02? What were the proceeds of the draft to the Stereohifi Company?

22. Potwin Brothers of Canada imported from Lancashire Automobiles, England, 48 automobiles invoiced at £816. 17s. 6d. each. They also purchased from Werner Company of West Germany 56 automobiles invoiced at 5,216.15 marks each. The English company and the German company drew ninety-day drafts on Potwin Brothers of Canada on December 18. How much would the drafts cost Potwin Brothers in Canadian funds? If both the English and the German company discounted the drafts at 6% on December 27, how much did each company receive?

## SECTION 5 Graphic Presentation

There are probably more tables and graphs to be found in the financial pages of the daily newspapers and the weekly financial papers, illustrating the import and export business between Canada and other nations, than on any other single subject.

Figure 8-5 represents the exports to and the imports from Norway during the last nine years. Norway's area is approximately  $\frac{1}{25}$  of our area and their population about  $\frac{1}{5}$  of ours.

## WORKOUT EXERCISE VI

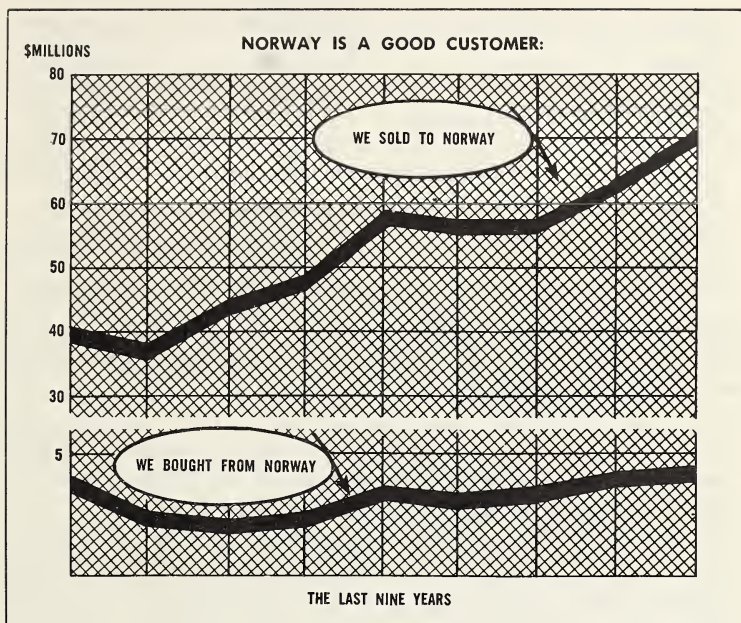
1. Japanese exports to Canada in the last four years were, in millions of dollars: 61.6, 70.2, 102.9, 110.3. Canadian exports to Japan for the same time were, in millions of dollars: 139.1, 104.8, 139.8, 178.0. Draw a line graph similar to figure 8-5 to compare our exports to and imports from Japan.

2. Japan's largest export to Canada in the last four years was textiles which, in millions of dollars, amounted to: 18.3, 24.0, 35.3, 37.0. Canada's largest export to Japan was wheat which, in millions of dollars, amounted to: 53.7, 62.7, 69.2, 82.1. What percentage was each of the total yearly exports?

3. Draw a multiple bar graph to compare each year's exports from and imports to Canada from Japan. Let each bar be divided to show the main export as well as the total export from each of the countries.

Figure 8-5

## A Graph From the Financial Pages



4. Draw a bar graph to show the United Kingdom exports to and imports from the following countries in millions of dollars:

	<i>U.K. Exports</i>	<i>U.K. Imports</i>
Canada	\$ 589	\$1,035
United States	890	1,565
U.S.S.R.	211	384
Latin America	472	860
Sterling Area	3,926	4,182
Other Countries	1,192	1,429

5. The number of tourists visiting Germany in each of the last ten years has been: 14,900; 21,300; 41,000; 61,100; 55,550; 67,000; 79,600; 88,000; 88,000; 98,000. Draw a line graph to show these visits.

6. If each tourist stayed an average of three days in Germany and spent an average of \$25.00 a day, how much revenue, in D. marks, would this bring to Germany. Use the latest quotation available for the calculation, and illustrate this information by means of a line graph.



## 7. Canadian exports to France amounted to:

	<i>This Year</i>	<i>Last Year</i>
Total:	<u>\$72,907,000</u>	<u>\$43,157,000</u>
Wheat	\$13,410,000	\$ 3,859,000
Seed	4,222,000	3,088,000
Lumber, pulp, and newsprint	6,163,000	3,419,000
Aluminum	4,088,000	8,779,000
Copper	7,619,000	5,870,000
Nickel	6,722,000	746,000
Asbestos	5,195,000	5,028,000
Plastics, etc.	16,784,000	—
Others	64,704,000	30,789,000

Draw a component bar graph to illustrate this information. "Break" the "other exports" in order to use a larger scale so that the vertical scale starts near 30,000,000.

8. Last year, Canadian exports to and imports from the following countries were, in thousands of dollars: Japan, \$178 exports and \$110 imports; India and Ceylon, \$39 exports and \$45 imports. Draw a multiple bar graph to illustrate this information.

9. In the last six years, Canadian wheat exports to West Germany were, in millions of dollars: \$37.1, \$66.25, \$58.8, \$38.5, \$51.7, \$41.8; while Canadian aluminum exports to West Germany were: \$4.9, \$3.75, \$9.2, \$13.5, \$15.3, \$34.5. Draw a component bar graph to illustrate this information.

10. What per cent of the total yearly exports to West Germany (problem 9) consisted of wheat?

11. Canadian exports to and imports from the following countries in the last ten years were, in millions of dollars, as follows:

*Exports*

United Kingdom: 704.4; 470.4; 631.2; 746.4; 664.8; 654.0; 769.2; 812.4; 738.0; 776.4.

Other Commonwealth countries: 309.6; 184.8; 241.2; 261.6; 232.8; 195.6; 237.6; 243.6; 232.8; 283.2.

Latin America: 126.0; 144.0; 207.6; 272.4; 198.0; 187.2; 160.8; 176.4; 224.4; 180.0.

*Imports*

United Kingdom: 307.2; 404.4; 421.2; 360.0; 453.6; 392.4; 400.8; 484.8; 522.0; 526.8.

Other Commonwealth countries: 187.2; 241.2; 305.0; 184.8; 170.4; 181.2; 210.0; 220.8; 238.8; 210.0.

Latin America: 192.0; 213.6; 273.6; 284.4; 290.4; 284.4; 319.2; 362.4; 361.2; 340.4.

(a) Draw a multiple line chart showing Canadian exports to these countries.

(b) Draw a multiple line chart showing Canadian imports from the three countries.

(c) Draw a multiple line chart to show the balance of trade with each of these countries. (See chapter heading.)

### **Control of Foreign Exchange**

All countries have exchange control in varying degrees and charge import and export duty on goods entering and leaving the country; in addition, blocks of trading areas agree to trade on better terms with each other than parties outside the agreement. This aspect of trade will be dealt with more fully in the chapter on taxation.

### **The World Bank**

To help countries with adverse monetary balances which unfavourably affect trade, in 1946 the United Nations established the International Monetary Fund and the International Bank for Reconstruction and Development. The fund attempts to establish exchange stability and remove foreign-exchange restrictions by granting member countries loans to cover their monetary international deficits.

### **Other Foreign Aid**

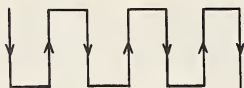
The more advanced nations have also helped to supplement the aid given by the International Fund and Bank by outright grants of aid. The United States have contributed largely. Canada has contributed an average of \$50 million a year through the Colombo plan, an international plan which attempts to provide aid on a continuing basis. The Organization for Economic Co-operation and Development started in the autumn of 1961 and is composed of eighteen nations, including Canada; its objective is to aid the less developed countries over an extended period.

## **SECTION 6 Figuring for Fun**

1. A problem in cryptography, the art of writing secret messages. By route transposition:

(a) Use a geometric figure; e.g., a rectangle divided into 7 columns and 5 rows.

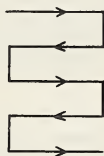
(b) In the squares print the message following a pre-determined route. For example, the message could read: "Be at Blake and Harbord at eleven o'clock." As there are 35 available squares and 33 letters in the message, fill in the remaining two squares with a predetermined letter; e.g., the letter "X". Let us say that the route followed is:



The printed message, then, will look like this:

B	A	N	A	T	L	O
E	E	D	D	E	C	C
A	K	H	R	L	O	K
T	A	A	O	E	N	X
B	L	R	B	V	E	X

(c) Write the coded message by reading the letters via another route; for example:

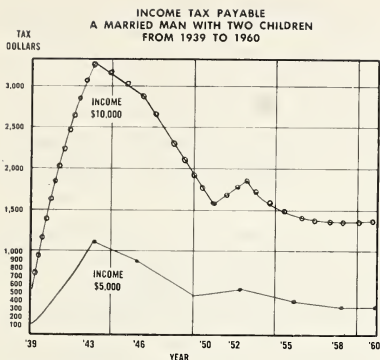


Arrange letters in groups of five as this conforms to the International Telegraphic regulations governing the cost of sending messages. The coded message then reads:

BANAT LOCCE DDEEA KHRLO KXNEO AATBL RBVEX

- (i) Decipher the above message by reversing the above steps.
- (ii) Make up another message using the same "routes".
- (iii) Evolve your own routes using some other figure.
- (iv) Try and solve a cyphered message made up by a classmate.

2. You have eight coins and a balance. If one of the coins is counterfeit and slightly lighter in weight and you are allowed to use the balance only twice, how can you find the defective coin?



## Income Tax

### 9

#### A Business Problem

The Hollinger Corporation have maintained for several years a fleet of trucks for delivery service to their customers. This year, however, they decide to discontinue their delivery service and pay a transport company to make any necessary deliveries for them.

The fleet of trucks is sold for \$31,029.68, and at the time of sale the undepreciated capital cost of the trucks is \$23,049.23. The Income Tax Department reclaim the difference as excess depreciation, and the Hollinger Corporation have the option of adding this difference back to their profits in the present year, or to divide it equally and add it back to the profits of the previous five years. Their profit this year is \$34,749. The profits for the five previous years were: \$30,174; \$37,389; \$33,428; \$35,472; \$33,984.

Advise the Hollinger Corporation whether to add the excess depreciation all back this year or whether to adjust the previous five years' profits.

#### The Income Tax Act

All individuals who live in Canada, all who are employed or carry on business in Canada, and all corporations who locate or carry on business in Canada are subject to the payment of income tax.

The exemptions and tax rates are subject to change each year and are incorporated in the *Income Tax Act*, which is administered by the Department of National Revenue, a department of the Federal Government.

### SECTION 1 Individual Income Tax, Income and Deductions

Income tax is paid to the Federal Government by individuals on income they receive from all sources during the calendar year, or, with qualifications, that part of the calendar year that they are resident in Canada.

The tax is levied by the Federal Government on individual incomes on behalf of both the federal and provincial governments. Each province, except Quebec, receives back an annual amount calculated according to the Federal-Provincial Tax-Sharing Arrangement Act. The Province of Quebec have elected to collect their share of personal income tax themselves. The individual in Quebec therefore pays two taxes, one provincial and one federal, but is allowed a deduction from the full federal tax.

When an individual is employed by a company, the company must deduct, on behalf of the Government, the income tax payable on the salary earned. On obtaining employment and at the beginning of each year thereafter, each individual must file with his employer Form TD1, the Tax Deduction Declaration form, so that the employer may know the individual's marital status, number of dependents, and the deductions to which he is entitled. Figure 9-1 shows a table of some of the allowable deductions.

**Figure 9-1 Allowable Deductions From Personal Income**

<i>Basic</i>	
Single person, no dependents .....	\$1,000
Married person, supporting spouse .....	2,000
Single person, supporting wholly dependent relative .....	2,000
Over 65 years of age, additional .....	500
<i>Dependents, in addition to above</i>	
Child, under 16, qualified for family allowance .....	300
Child, 16 and over, still dependent (includes children over 21 if attending University) .....	550
Parent, mentally or physically disabled .....	550
<i>Other Deductions</i>	
Basic exemption, without receipts .....	100
(for medical expenses, charitable donations and professional fees) or, with receipts:	
Medical expenses, in excess of 3% of net income.	
Charitable donations (maximum: 10% of net income).	
Registered pension fund contributions (maximum \$1,500).	
Registered retirement savings plan contributions, lesser of 10% of earned income or \$2,500. (If also covered under pension fund, contribution \$2,500 reduced to \$1,500.)	
University tuition fees.	
20% of dividends from Canadian corporations may be deducted from tax payable.	

To claim the full \$2,000 deduction for the support of a wife, the wife may not earn more than \$250. If earnings are in excess of \$250, the amount earned must be deducted from \$1,250. For example, if



Tom Jones' wife has an income of \$750 for the year, Tom Jones' exemption will be \$1,500 [ $\$1,000 + (1,250 - 750)$ ].

No person or child in receipt of more than \$950 a year can be claimed as a dependent. University fees are deductible from the student's income (not the parent's) if the student is in full time attendance. This deduction may be used to reduce the student's income below \$950 so that he may be claimed as a dependent. There is no stipulation, however, that the student himself must pay the fees.

*Example:* Fraser Thoms received an annual salary of \$13,500 and earned \$500 in dividends from Canadian corporations. 8% of his salary was deducted for a registered pension fund. His wife received interest on bond investments totalling \$475. His three sons, James, 19, Harry, 16, and Norman, 13, were all dependent. James was attending University and his fees for the year amounted to \$525. During the summer he earned \$1,400. Medical expenses for the year amounted to \$750. Charitable donations amounted to \$425. What was the amount of his taxable income?

-----  
Computation of deductions:

Personal exemption:	\$1,775.00
$[\$1,000 + (1,250 - 475)]$	

Dependent exemptions:

James and Harry, \$550 each	1,100.00
Norman, under 16	300.00
Total exemptions *	<u>\$3,175.00</u>

Other deductions:

Registered pension fund:		
8% of \$13,500		1,080.00

Medical expenses: ***	\$750.00	
-----------------------	----------	--

Less 3% of net** income:		
(net income:		

$\$14,000 - \$1,080 = \$12,920$	<u>387.60</u>	362.40
---------------------------------	---------------	--------

Charitable donations: ***		<u>425.00</u>
---------------------------	--	---------------

Total deductions:		<u><u>\$ 5,042.40</u></u>
-------------------	--	---------------------------

Computation of taxable income:

Annual salary	\$13,500.00
---------------	-------------

Income from dividends	500.00
-----------------------	--------

Total gross income	<u>\$14,000.00</u>
--------------------	--------------------

Less: total deductions	<u>5,042.40</u>
------------------------	-----------------

Taxable income	<u><u>\$ 8,957.60</u></u>
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\*, \*\*, \*\*\*. See next page for notes.

*\*Total Exemptions.* This is the figure used by the employer, plus any pension deduction he makes, to calculate the amount he must deduct for income tax from the employee's pay each pay day.

*\*\*Net Income.* It will be noticed that the amount that is deducted from the medical expenses is 3% of net income. The net income is the gross or total income less certain types of expense which are allowed as deductions from gross income by the Income Tax Act to arrive at the net income. Registered pension plan payments are such an allowable deduction. Any other expenses of this kind will be indicated to you when they occur.

*\*\*\**An individual having no receipts for medical or charitable donations, professional fees, or receipts totalling less than \$100, may claim \$100 basic exemption. However, if he holds receipts which will give him a total exemption of more than \$100, he will be wise to submit the receipts and claim the larger amount.

## WORKOUT EXERCISE I

1. Samuel Franks earns a salary of \$13,500 a year. His wife earns \$755 on a part-time job. He has three children: Harry, 19, works full time; James, 17, is at high school; and Mabel, 12, is in elementary school. What was Samuel Franks' taxable income for the year?
2. Thomas Hind earns a salary of \$12,500 a year. He has three children: Kenneth, 19, attends University; he earned \$1,450 in the summer and paid University fees of \$510. Florence, 17, and Fred, 14, both attend high school. Hind's wife had no income. What was Hind's taxable income?
3. David Gallagher earns \$10,500 a year and receives \$200 as bond interest and \$150 as dividends from shares held in a taxable Canadian corporation. His wife has an income of \$550, and his eldest daughter Pauline, 18, who works as a stenographer, earns \$3,000 a year. Christine, 17, earns \$1,150 working after school; and Jacqueline, 13, earns \$250 on a paper route. Mr. Gallagher pays 6% of his salary into a registered pension fund and has receipts for charitable donations amounting to \$175. What was his taxable income?
4. Frederick Watkins earns a salary of \$8,750 a year and has four children aged 18, 16, 14, and 12, all attending school, none of whom are earning more than \$950. His wife earns \$550 on a part-time basis. Mr. Watkins pays 6% of his salary into a registered pension fund and contributes 1% of his salary to the United Appeal. His medical expenses amounted to: for himself, \$50; for his wife, \$75; for his children, \$35. What was his taxable income?

5. George Varcoe earns \$7,450 a year for a full-time daytime job and \$450 a year for a part-time evening job. His wife earns \$825 a year for a part-time job. His income from taxable Canadian corporations amounts to \$750 a year. He has three children. Pauline, 20, attends University, earned \$900 for part-time summer work, and paid University fees of \$510. Sally, 16, and Tommy, 15, both attend high school. Medical expenses during the year amounted to \$450. Mr. Varcoe pays 8% per annum of his full-time salary into a registered pension plan and  $\frac{1}{2}\%$  of his full-time salary to a charity. Mr. Varcoe's invalid mother, who receives the Old Age Pension of \$780 a year, lives with the family and is wholly dependent upon them. What is Mr. Varcoe's taxable income?

6. Harry Wilson, who is unmarried, has his father living with him. The father receives the Old Age Pension of \$900 but is otherwise dependent upon Harry. Medical bills for Harry's father during the year amounted to \$850. Harry receives a salary of \$5,780 a year and, in addition, receives interest of \$310 on Canada Saving Bonds that he owns and dividends on taxable Canadian corporations of \$270. Harry pays 6% of his salary into a registered pension fund and during the year contributed \$650 to charitable organizations. How much is Harry Wilson's taxable income?

## SECTION 2      Calculation of Tax

Employers are responsible for deducting income tax on salaries and wages at the source before paying the salary to the individual and must remit the amount deducted to the government each month. Income tax for wage earners, therefore, is normally paid on the money as it is earned.

On or before April 30 of each year, the individual must file a yearly return of income for the previous calendar year using a printed form furnished by the Department of National Revenue. The form, T1 Short, used when income is derived from working for a company and with investment income less than \$2,400, is reproduced in figures 9-4 and 9-5. Another form, T1 General, must be used if individuals are in business as sole proprietors or partners, are in receipt of professional fees, or have an investment income of over \$2,400 a year.

After completing the return, any balance of tax owing must be remitted immediately to the Department of National Revenue. If income tax has been overpaid, a rebate may be claimed.

*Example:* James Trudeau receives an annual salary of \$6,000 paid on a semi-monthly basis, in addition to \$400 received from Canadian corporation dividends. 6% of his salary is deducted for a registered pension fund. His wife has an income of \$550. Four children, ages 9, 10, 16 and 17, are all at school. James made charitable donations of \$300 and had medical expenses of \$350, for which he holds receipts. With the use of figures 9-1, 9-2, 9-3, calculate: (a) total tax deductions, (b) taxable income, (c) total tax payable, (d) additional tax payable or rebate receivable.

(a) Total deductions:

Personal exemption:

[ $\$1,000 + (\$1,250 - \$550)$ ] \$1,700.00

Dependent exemptions:

2 children, \$300 each \$ 600.00

2 children, \$550 each \$1,100.00 \$1,700.00

Other deductions:

Registered pension fund,

6% of \$6,000 \$ 360.00

Medical expenses \$350.00

less 3% net

income \$5,640 169.20 180.80

Charitable donations 300.00 840.80

Total Deductions \$4,240.80

(b) Taxable income:

Annual salary \$6,000.00

Income from dividends 400.00

Total gross income \$6,400.00

Less total deductions 4,240.80

Taxable Income \$2,159.20

(c) Total tax payable:

From figure 9-3: Federal, \$297,

Provincial \$44.20 \$ 341.20

Less deduction: 20% of \$400 dividends 80.00

Tax Payable \$ 261.20

(d) Rebate:

Amount paid — amount due, \$399.60 — \$261.20 \$ 78.40

Figure 9-2 is a table of semi-monthly tax deductions and is used to calculate the tax deducted at source.



Figure 9-2 Semi-Monthly Tax Deductions

SEMI-MONTHLY TAX DEDUCTIONS — TABLE 13 — DÉDUCTIONS D'IMPÔT SEMI-MENSUELLES															17
Basis—24 Pay Periods per Year															Base—24 périodes de paie par année
SEMI-MONTHLY PAY Pay approprié bracket  PAIE SEMI-MENSUELLE Utiliser le palier approprié	IF THE TOTAL OF EXEMPTIONS IS — SI LE TOTAL DES EXEMPTIONS EST DE														
	\$1,000 \$1,249	\$1,250 \$1,499	\$1,500 \$1,749	\$1,750 \$1,999	\$2,000 \$2,249	\$2,250 \$2,499	\$2,500 \$2,749	\$2,500 \$2,999	\$3,000 \$3,249	\$3,250 \$3,499	\$3,500 \$3,749	\$3,750 \$3,999	\$4,000 \$4,249	\$4,250 \$4,499	\$4,500 \$4,750
DEDUCT FROM EACH PAY — DÉDUISEZ SUR CHAQUE PAIE															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
\$220.00 — \$224.99	\$30.80	\$28.60	\$26.65	\$24.65	\$22.70	\$20.65	\$18.60	\$16.50	\$14.40	\$12.40	\$10.65	\$ 8.90	\$ 7.10	\$ 5.45	\$ 3.95
\$225.00 — \$229.99	\$31.80	\$29.65	\$27.60	\$25.60	\$23.65	\$21.65	\$19.60	\$17.50	\$15.40	\$13.35	\$11.50	\$ 9.75	\$ 7.95	\$ 6.20	\$ 4.65
\$230.00 — \$234.99	\$33.00	\$30.75	\$28.55	\$26.55	\$24.60	\$22.60	\$20.60	\$18.50	\$16.40	\$14.35	\$12.35	\$10.60	\$ 8.80	\$ 7.05	\$ 5.35
\$235.00 — \$239.99	\$34.10	\$31.85	\$29.55	\$27.50	\$25.55	\$23.55	\$21.55	\$19.50	\$17.40	\$15.35	\$13.25	\$11.45	\$ 9.65	\$ 7.90	\$ 6.10
\$240.00 — \$244.99	\$35.20	\$32.95	\$30.65	\$28.45	\$26.50	\$24.50	\$22.50	\$20.50	\$18.40	\$16.35	\$14.25	\$12.30	\$10.50	\$ 8.75	\$ 6.95
\$245.00 — \$249.99	\$36.30	\$34.05	\$31.75	\$29.45	\$27.45	\$25.45	\$23.45	\$21.40	\$19.35	\$17.25	\$15.15	\$13.15	\$11.35	\$ 9.60	\$ 7.80
\$250.00 — \$254.99	\$37.40	\$35.15	\$32.85	\$30.55	\$28.40	\$26.40	\$24.40	\$22.40	\$20.35	\$18.25	\$16.15	\$14.10	\$12.20	\$10.40	\$ 8.65
\$255.00 — \$259.99	\$38.50	\$36.25	\$33.95	\$31.65	\$29.35	\$27.35	\$25.35	\$23.30	\$21.25	\$19.15	\$17.05	\$15.15	\$13.10	\$11.30	\$ 9.50
\$260.00 — \$264.99	\$39.60	\$37.35	\$35.05	\$32.75	\$30.45	\$28.30	\$26.30	\$24.25	\$22.20	\$20.15	\$18.05	\$15.95	\$14.10	\$12.15	\$10.35
\$265.00 — \$269.99	\$40.70	\$38.45	\$36.15	\$33.85	\$31.55	\$29.25	\$27.25	\$25.20	\$23.15	\$21.15	\$19.05	\$17.15	\$15.10	\$13.00	\$11.20
\$270.00 — \$274.99	\$41.80	\$39.55	\$37.25	\$34.95	\$32.65	\$30.35	\$28.20	\$26.25	\$24.20	\$22.20	\$20.25	\$18.15	\$16.10	\$14.00	\$12.05
\$275.00 — \$279.99	\$42.90	\$40.65	\$38.35	\$36.05	\$33.75	\$31.45	\$29.15	\$27.20	\$25.20	\$23.25	\$21.25	\$19.15	\$17.10	\$15.00	\$12.90
\$280.00 — \$284.99	\$44.00	\$41.75	\$39.45	\$37.15	\$34.85	\$32.55	\$30.25	\$28.15	\$26.15	\$24.20	\$22.20	\$20.15	\$18.10	\$16.00	\$13.90
\$285.00 — \$289.99	\$45.10	\$42.85	\$40.55	\$38.25	\$35.95	\$33.65	\$31.35	\$29.10	\$27.10	\$25.15	\$23.15	\$21.15	\$19.10	\$17.00	\$14.90
\$290.00 — \$294.99	\$46.20	\$43.95	\$41.65	\$39.35	\$37.05	\$34.75	\$32.45	\$30.20	\$28.20	\$26.25	\$24.20	\$22.10	\$20.10	\$18.00	\$15.90
\$295.00 — \$299.99	\$47.30	\$45.05	\$42.75	\$40.45	\$38.15	\$35.85	\$33.55	\$31.30	\$29.20	\$27.25	\$25.25	\$23.25	\$21.10	\$19.00	\$16.90
\$300.00 — \$304.99	\$48.40	\$46.15	\$43.85	\$41.55	\$39.25	\$36.95	\$34.65	\$32.40	\$30.30	\$28.30	\$26.30	\$24.20	\$22.05	\$20.00	\$17.90
\$305.00 — \$309.99	\$49.50	\$47.25	\$44.95	\$42.65	\$40.35	\$38.05	\$35.75	\$33.50	\$31.40	\$29.40	\$27.45	\$25.45	\$23.30	\$21.00	\$18.90
\$310.00 — \$314.99	\$51.20	\$48.90	\$46.65	\$44.35	\$42.05	\$39.75	\$37.45	\$35.20	\$33.10	\$31.10	\$29.10	\$27.10	\$25.05	\$22.95	\$20.90
\$315.00 — \$319.99	\$52.50	\$50.20	\$47.95	\$45.65	\$43.35	\$41.05	\$38.75	\$36.50	\$34.40	\$32.40	\$30.40	\$28.40	\$26.35	\$24.25	\$22.20
\$320.00 — \$324.99	\$53.80	\$51.50	\$49.25	\$46.95	\$44.65	\$42.35	\$40.05	\$37.80	\$35.70	\$33.70	\$31.70	\$29.70	\$27.65	\$25.55	\$23.50
\$325.00 — \$329.99	\$55.10	\$52.80	\$50.55	\$48.25	\$45.95	\$43.65	\$41.35	\$39.10	\$37.00	\$35.00	\$33.00	\$31.00	\$28.95	\$26.85	\$24.80
\$330.00 — \$334.99	\$56.40	\$54.10	\$51.85	\$49.55	\$47.25	\$44.95	\$42.65	\$40.40	\$38.30	\$36.30	\$34.30	\$32.30	\$30.25	\$28.15	\$26.10
\$335.00 — \$339.99	\$57.70	\$55.40	\$53.15	\$50.85	\$48.55	\$46.25	\$43.95	\$41.70	\$39.60	\$37.60	\$35.60	\$33.60	\$31.55	\$29.45	\$27.40
\$340.00 — \$344.99	\$59.00	\$56.70	\$54.50	\$52.25	\$49.95	\$47.65	\$45.35	\$43.10	\$40.90	\$38.90	\$36.90	\$34.90	\$32.90	\$30.85	\$28.80
\$345.00 — \$349.99	\$60.30	\$58.00	\$55.80	\$53.55	\$51.25	\$48.95	\$46.65	\$44.40	\$42.20	\$40.20	\$38.20	\$36.20	\$34.20	\$32.15	\$30.10
\$350.00 — \$354.99	\$61.60	\$59.30	\$57.10	\$54.85	\$52.55	\$50.25	\$47.95	\$45.70	\$43.50	\$41.50	\$39.50	\$37.50	\$35.45	\$33.35	\$31.30
\$355.00 — \$359.99	\$62.90	\$60.60	\$58.45	\$56.15	\$53.85	\$51.55	\$49.25	\$47.00	\$44.80	\$42.80	\$40.80	\$38.80	\$36.75	\$34.65	\$32.60
\$360.00 — \$364.99	\$64.20	\$61.90	\$59.75	\$57.45	\$55.15	\$52.85	\$50.55	\$48.30	\$46.10	\$44.10	\$42.10	\$40.10	\$38.05	\$35.95	\$33.90
\$365.00 — \$369.99	\$65.50	\$63.20	\$61.05	\$58.75	\$56.45	\$54.15	\$51.85	\$49.60	\$47.40	\$45.40	\$43.40	\$41.40	\$39.35	\$37.25	\$35.20
\$370.00 — \$374.99	\$66.80	\$64.50	\$62.35	\$60.05	\$57.75	\$55.45	\$53.15	\$50.90	\$48.70	\$46.70	\$44.70	\$42.70	\$40.65	\$38.55	\$36.50
\$375.00 — \$379.99	\$68.10	\$65.80	\$63.65	\$61.35	\$59.05	\$56.75	\$54.45	\$52.15	\$49.90	\$47.80	\$45.80	\$43.80	\$41.75	\$39.65	\$37.60
\$380.00 — \$384.99	\$69.40	\$67.10	\$64.95	\$62.65	\$60.35	\$58.05	\$55.75	\$53.45	\$51.20	\$49.10	\$47.10	\$45.10	\$43.05	\$40.95	\$38.90
\$385.00 — \$389.99	\$70.70	\$68.40	\$66.25	\$63.95	\$61.65	\$59.35	\$57.05	\$54.75	\$52.50	\$50.40	\$48.40	\$46.40	\$44.35	\$42.25	\$40.20
\$390.00 — \$394.99	\$72.00	\$69.70	\$67.55	\$65.25	\$62.95	\$60.65	\$58.35	\$56.05	\$53.80	\$51.70	\$49.70	\$47.70	\$45.65	\$43.55	\$41.50
\$395.00 — \$399.99	\$73.30	\$71.00	\$68.85	\$66.55	\$64.25	\$61.95	\$59.65	\$57.35	\$55.10	\$53.00	\$51.00	\$49.00	\$47.00	\$45.00	\$43.00
\$400.00 — \$404.99	\$74.60	\$72.30	\$70.15	\$67.85	\$65.55	\$63.25	\$60.95	\$58.65	\$56.40	\$54.30	\$52.30	\$50.30	\$48.30	\$46.30	\$44.30
\$405.00 — \$409.99	\$75.90	\$73.60	\$71.45	\$69.15	\$66.85	\$64.55	\$62.25	\$59.95	\$57.70	\$55.60	\$53.60	\$51.60	\$49.60	\$47.60	\$45.60
\$410.00 — \$414.99	\$77.20	\$74.90	\$72.75	\$70.45	\$68.15	\$65.85	\$63.55	\$61.25	\$59.00	\$56.90	\$54.90	\$52.90	\$50.90	\$48.90	\$46.90
\$415.00 — \$419.99	\$78.50	\$76.20	\$74.05	\$71.75	\$69.45	\$67.15	\$64.85	\$62.55	\$60.30	\$58.20	\$56.20	\$54.20	\$52.20	\$50.20	\$48.20
\$420.00 — \$424.99	\$79.80	\$77.50	\$75.35	\$73.05	\$70.75	\$68.45	\$66.15	\$63.85	\$61.60	\$59.50	\$57.50	\$55.50	\$53.50	\$51.50	\$49.50
\$425.00 — \$429.99	\$81.10	\$78.80	\$76.65	\$74.35	\$72.05	\$69.75	\$67.45	\$65.15	\$62.90	\$60.80	\$58.80	\$56.80	\$54.80	\$52.80	\$50.80
\$430.00 — \$434.99	\$82.40	\$80.10	\$77.95	\$75.65	\$73.35	\$71.05	\$68.75	\$66.45	\$64.20	\$62.10	\$60.10	\$58.10	\$56.10	\$54.10	\$52.10
\$435.00 — \$439.99	\$83.70	\$81.40	\$79.25	\$76.95	\$74.65	\$72.35	\$70.05	\$67.75	\$65.50	\$63.40	\$61.40	\$59.40	\$57.40	\$55.40	\$53.40
\$440.00 — \$444.99	\$85.00	\$82.70	\$80.55	\$78.25	\$75.95	\$73.65	\$71.35	\$69.05	\$66.80	\$64.70	\$62.70	\$60.70	\$58.70	\$56.70	\$54.70
\$445.00 — \$449.99	\$86.30	\$84.00	\$81.85	\$79.55	\$77.25	\$74.95	\$72.65	\$70.35	\$68.10	\$66.00	\$64.00	\$62.00	\$60.00	\$58.00	\$56.00
\$450.00 — \$454.99	\$87.60	\$85.30	\$83.15	\$80.85	\$78.55	\$76.25	\$73.95	\$71.65	\$69.40	\$67.30	\$65.30	\$63.30	\$61.30	\$59.30	\$57.30
\$455.00 — \$459.99	\$88.90	\$86.60	\$84.45	\$82.15	\$79.85	\$77.55	\$75.25	\$72.95	\$70.70	\$68.60	\$66.60	\$64.60	\$62.60	\$60.60	\$58.60
\$460.00 — \$464.99	\$90.20	\$87.90	\$85.75	\$83.45	\$81.15	\$78.85	\$76.55	\$74.25	\$72.00	\$70.00	\$68.00	\$66.00	\$64.00	\$62.00	\$60.00
\$465.00 — \$469.99	\$91.50	\$89.20	\$87.05	\$84.75	\$82.45	\$80.15	\$77.85	\$75.55	\$73.30	\$71.20	\$69.20	\$67.20	\$65.20	\$63.20	\$61.20
\$470.00 — \$474.99	\$92.80	\$90.50	\$88.35	\$86.05	\$83.75	\$81.45	\$79.15	\$76.85	\$74.60	\$72.50	\$70.50	\$68.50	\$66.50	\$64.50	\$62.50
\$475.00 — \$479.99	\$94.10	\$91.80	\$89.65	\$87.35	\$85.05	\$82.75	\$80.45	\$78.15	\$75.90	\$73.80	\$71.80	\$69.80	\$67.80	\$65.80	\$63.80
\$480.00 — \$484.99	\$95.40	\$93.10	\$90.95	\$88.65	\$86.35	\$84.05	\$81.75	\$79.45	\$77.20	\$75.10	\$73.10	\$71.10	\$69.10	\$67.10	\$65.10
\$485.00 — \$489.99	\$96.70	\$94.40	\$92.25	\$89.95	\$87.65	\$85.35	\$83.05	\$80.75	\$78.50	\$76.40	\$74.40	\$72.40	\$70.40	\$68.40	\$66.40
\$490.00 — \$494.99	\$98.00	\$95.70	\$93.55	\$91.25	\$88.95	\$86.65	\$84.35	\$82.05	\$79.80	\$77.70	\$75.70	\$73.70	\$71.70	\$69.70	\$67.70
\$495.00 — \$499.99	\$99.30	\$97.00	\$94.85	\$92.55	\$90.25	\$87.95	\$85.65	\$83.35	\$81.10	\$79.00	\$77.00	\$75.00	\$73.00	\$71.00	\$69.00
\$500.00 — \$504.99	\$100.60	\$98.30	\$96.15	\$93.85	\$91.55	\$89.25	\$86.95	\$84.65	\$82.40	\$80.30	\$78.30	\$76.30	\$74.30	\$72.30	\$70.30
\$505.00 — \$509.99	\$101.90	\$99.60	\$97.45	\$95.15	\$92.85	\$90.55	\$88.25	\$85.95	\$83.70	\$81.60	\$79.60	\$77.60	\$75.60	\$73.60	\$71.60
\$510.00 — \$514.99	\$103.20	\$100.90	\$98.75	\$96.45	\$94.15	\$91.85	\$89.55	\$87.25	\$85.00	\$82.90	\$80.90	\$78.90	\$76.90	\$74.90	\$72.90
\$515.00 — \$519.99	\$104.50	\$102.20	\$100.05	\$97.75	\$95.45	\$93.15	\$90.85	\$88.55	\$86.30	\$84.20	\$82.20	\$80.20	\$78.20	\$76.20	\$74.20
\$520.00 — \$524.99	\$105.80	\$103.50	\$101.35	\$99.05	\$96.75	\$94.45	\$92.15	\$89.85	\$87.60	\$85.50	\$83.50	\$81.50	\$79.50	\$77.50	\$75.50
\$525.00 — \$529.99	\$107.10	\$104.80	\$102.65	\$100.35	\$98.05	\$95.75	\$93.45	\$91.15	\$88.90	\$86.80	\$84.80	\$82.80	\$80.80	\$78.80	\$76.80
\$530.00 — \$534.99	\$108.40	\$106.10	\$103.95	\$101.65	\$99.35	\$97.05	\$94.75	\$92.45	\$90.20	\$88.10	\$86.10	\$84.10	\$82.10	\$80.10	\$78.10
\$535.00 — \$539.99	\$109.70	\$107.40	\$105.25	\$102.95	\$100.65	\$98.35	\$96.05	\$93.75	\$91.50	\$89.40	\$87.40	\$85.40	\$83.40	\$81.40	\$79.40
\$540.00 — \$544.99	\$111.00	\$108.70	\$106.55	\$104.25											



from Canadian corporations, if any.

(c) The amount of tax still payable or the rebate to be claimed. In problem 5, assume tax is not deducted at source for George Varcoe's part-time job.

7-12. For each of the above persons, calculate the per cent of their total income, before pension deduction, that they pay in income taxes.

Figure 9-3 Taxable Income \$3,000 or Under

1962 FEDERAL AND PROVINCIAL TAX TABLE

• "Federal Tax Payable" is the amount of federal tax after giving effect to the federal tax abatement (16% of basic tax) and including the old age security tax (3% of taxable income—maximum \$90).

• "Provincial Income Tax" is the amount of provincial income tax calculated at the rate (16% of basic tax) applicable for the Provinces of Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Ontario, Alberta and British Columbia.

Taxable Income Not Over	Federal Tax Payable \$	Provincial Income Tax \$	Taxable Income Over	Federal Tax Payable \$	Provincial Income Tax \$	Taxable Income Not Over	Federal Tax Payable \$	Provincial Income Tax \$	Taxable Income Over	Federal Tax Payable \$	Provincial Income Tax \$
0 - 10	1	\$0.10	600 - 610	74	\$10.60	1200 - 1210	153	\$22.20	1800 - 1810	241	\$35.60
10 - 20	2	.20	610 - 620	75	11.10	1210 - 1220	154	22.70	1810 - 1820	242	36.10
20 - 30	3	.30	620 - 630	77	11.60	1220 - 1230	156	23.20	1820 - 1830	244	36.60
30 - 40	4	.40	630 - 640	78	12.10	1230 - 1240	157	23.70	1830 - 1840	246	37.10
40 - 50	5	.50	640 - 650	79	12.60	1240 - 1250	158	24.20	1840 - 1850	248	37.60
50 - 60	6	.60	650 - 660	80	13.10	1250 - 1260	160	24.70	1850 - 1860	249	38.10
60 - 70	7	1.00	660 - 670	81	13.60	1260 - 1270	162	25.20	1860 - 1870	250	38.60
70 - 80	8	1.10	670 - 680	82	14.10	1270 - 1280	163	25.70	1870 - 1880	252	39.10
80 - 90	9	1.20	680 - 690	83	14.60	1280 - 1290	164	26.20	1880 - 1890	253	39.60
90 - 100	10	1.30	690 - 700	84	15.10	1290 - 1300	166	26.70	1890 - 1900	255	40.10
100 - 110	11	1.40	700 - 710	85	15.60	1300 - 1310	167	27.20	1900 - 1910	256	40.60
110 - 120	12	1.50	710 - 720	86	16.10	1310 - 1320	169	27.70	1910 - 1920	257	41.10
120 - 130	13	1.60	720 - 730	87	16.60	1320 - 1330	170	28.20	1920 - 1930	259	41.60
130 - 140	14	1.70	730 - 740	89	17.10	1330 - 1340	172	28.70	1930 - 1940	260	42.10
140 - 150	15	1.80	740 - 750	90	17.60	1340 - 1350	173	29.20	1940 - 1950	261	42.60
150 - 160	16	1.90	750 - 760	91	18.10	1350 - 1360	175	29.70	1950 - 1960	263	43.10
160 - 170	17	2.00	760 - 770	92	18.60	1360 - 1370	176	30.20	1960 - 1970	265	43.60
170 - 180	18	2.10	770 - 780	93	19.10	1370 - 1380	177	30.70	1970 - 1980	266	44.10
180 - 190	19	2.20	780 - 790	94	19.60	1380 - 1390	178	31.20	1980 - 1990	268	44.60
190 - 200	20	2.30	790 - 800	95	20.10	1390 - 1400	179	31.70	1990 - 2000	269	45.10
200 - 210	21	2.40	800 - 810	96	20.60	1400 - 1410	181	32.20	2000 - 2010	271	45.60
210 - 220	22	2.50	810 - 820	99	21.10	1410 - 1420	182	32.70	2010 - 2020	272	46.10
220 - 230	23	2.60	820 - 830	101	21.60	1420 - 1430	183	33.20	2020 - 2030	274	46.60
230 - 240	24	2.70	830 - 840	102	22.10	1430 - 1440	185	33.70	2030 - 2040	275	47.10
240 - 250	25	2.80	840 - 850	103	22.60	1440 - 1450	187	34.20	2040 - 2050	278	47.60
250 - 260	26	2.90	850 - 860	105	23.10	1450 - 1460	190	34.70	2050 - 2060	280	48.10
260 - 270	27	3.00	860 - 870	106	23.60	1460 - 1470	191	35.20	2060 - 2070	281	48.60
270 - 280	28	3.10	870 - 880	107	24.10	1470 - 1480	192	35.70	2070 - 2080	283	49.10
280 - 290	29	3.20	880 - 890	108	24.60	1480 - 1490	194	36.20	2080 - 2090	285	49.60
290 - 300	30	3.30	890 - 900	110	25.10	1490 - 1500	195	36.70	2090 - 2100	286	50.10
300 - 310	31	3.40	900 - 910	111	25.60	1500 - 1510	197	37.20	2100 - 2110	288	50.60
310 - 320	32	3.50	910 - 920	112	26.10	1510 - 1520	198	37.70	2110 - 2120	290	51.10
320 - 330	33	3.60	920 - 930	113	26.60	1520 - 1530	200	38.20	2120 - 2130	292	51.60
330 - 340	34	3.70	930 - 940	114	27.10	1530 - 1540	201	38.70	2130 - 2140	293	52.10
340 - 350	35	3.80	940 - 950	116	27.60	1540 - 1550	203	39.20	2140 - 2150	295	52.60
350 - 360	36	3.90	950 - 960	117	28.10	1550 - 1560	204	39.70	2150 - 2160	297	53.10
360 - 370	37	4.00	960 - 970	118	28.60	1560 - 1570	206	40.20	2160 - 2170	299	53.60
370 - 380	38	4.10	970 - 980	119	29.10	1570 - 1580	207	40.70	2170 - 2180	300	54.10
380 - 390	39	4.20	980 - 990	121	29.60	1580 - 1590	209	41.20	2180 - 2190	302	54.60
390 - 400	40	4.30	990 - 1000	122	30.10	1590 - 1600	210	41.70	2190 - 2200	304	55.10
400 - 410	41	4.40	1000 - 1010	123	30.60	1600 - 1610	212	31.20	2200 - 2210	305	55.60
410 - 420	42	4.50	1010 - 1020	125	31.10	1610 - 1620	213	31.70	2210 - 2220	307	56.10
420 - 430	43	4.60	1020 - 1030	126	31.60	1620 - 1630	215	32.20	2220 - 2230	309	56.60
430 - 440	44	4.70	1030 - 1040	128	32.10	1630 - 1640	216	32.70	2230 - 2240	311	57.10
440 - 450	45	4.80	1040 - 1050	129	32.60	1640 - 1650	218	33.20	2240 - 2250	312	57.60
450 - 460	46	4.90	1050 - 1060	131	33.10	1650 - 1660	219	33.70	2250 - 2260	314	58.10
460 - 470	47	5.00	1060 - 1070	132	33.60	1660 - 1670	220	34.20	2260 - 2270	316	58.60
470 - 480	48	5.10	1070 - 1080	133	34.10	1670 - 1680	222	34.70	2270 - 2280	318	59.10
480 - 490	49	5.20	1080 - 1090	135	34.60	1680 - 1690	224	35.20	2280 - 2290	319	59.60
490 - 500	50	5.30	1090 - 1100	136	35.10	1690 - 1700	225	35.70	2290 - 2300	321	60.10
500 - 510	51	5.40	1100 - 1110	138	35.60	1700 - 1710	226	36.20	2300 - 2310	323	60.60
510 - 520	52	5.50	1110 - 1120	139	36.10	1710 - 1720	228	36.70	2310 - 2320	324	61.10
520 - 530	53	5.60	1120 - 1130	140	36.60	1720 - 1730	229	37.20	2320 - 2330	326	61.60
530 - 540	54	5.70	1130 - 1140	142	37.10	1730 - 1740	231	37.70	2330 - 2340	328	62.10
540 - 550	55	5.80	1140 - 1150	144	37.60	1740 - 1750	232	38.20	2340 - 2350	330	62.60
550 - 560	56	5.90	1150 - 1160	146	38.10	1750 - 1760	234	38.70	2350 - 2360	332	63.10
560 - 570	57	6.00	1160 - 1170	147	38.60	1760 - 1770	235	39.20	2360 - 2370	333	63.60
570 - 580	58	6.10	1170 - 1180	148	39.10	1770 - 1780	237	39.70	2370 - 2380	335	64.10
580 - 590	59	6.20	1180 - 1190	150	39.60	1780 - 1790	238	40.20	2380 - 2390	337	64.60
590 - 600	60	6.30	1190 - 1200	151	40.10	1790 - 1800	240	40.70	2390 - 2400	338	65.10

## SECTION 3     The Income Tax Return

The individual income tax return is reproduced in figures 9-4 and 9-5. This form is filled in for Fraser Thoms of a previous example.

The front of the form contains the following data:

- (a) Personal information is recorded in the upper section.
- (b) Under "Income": Salaries, dividends, and other income are listed.
- (c) Under "Deductions": Allowable expenses are first deducted to arrive at the *net* income. Then personal exemptions, medical expenses, and charitable donations are deducted to arrive at the *taxable* income. This corresponds to the figures we found in Workout Exercise I.

(d) The next section is "Calculation of Tax". If, as in this case, taxable income exceeds \$3,000, the table in figure 9-6 must be used. This gives the federal tax separately from the provincial tax. On \$8,957.60 the federal tax would be:

On \$8,000.00	\$1,570.00
On 957.60 — 30%	287.28
	<u>\$1,857.28</u>

This total federal income tax is reduced by (1) dividend credit of 20% of all dividends received from Canadian corporations and (2) by a 16% abatement for provincial taxes. The result is the federal tax. Old age security tax is then added, the lesser of \$90 or 3% of *taxable* income. Finally the provincial tax is added according to the rates in figure 9-6(b).

*Note:* If taxable income is under \$3,000, use figure 9-3 and commence at arrow on form. Tax deducted at source is found from figure 9-2.

Semi-monthly pay:  $\$13,500 \div 24 = \$562.50$

Exemptions:  $\$3,175 + \$1,080 = \$4,255$

Semi-monthly deductions \$82.50

Total deduction:  $\$82.50 \times 24$  \$1,987.20

The back of the form contains the information for, and the calculation of, the personal exemptions. Everyone claims the basic \$1,000 exemption; the first section claims an exemption for marital status. Note that any person, whether married or single, wholly supporting dependents may claim under this section if the conditions are complied with. The next section records the exemptions for dependent children, other than claimed in the first section; and the third section claims for other dependent relatives.

Figure 9-4 Form T1 Short, Income Tax Return, Front

<b>T1 SHORT</b> <b>1962</b>		 <b>CANADA</b>	
<h2 style="margin: 0;">Individual Income Tax Return</h2>			
• ONE SIGNED RETURN together with payment of balance of tax, if any, is to be mailed not later than 30th APRIL, 1963, to the TAXATION DATA CENTRE, P.O. BOX 456, OTTAWA 2, ONT.			
FAMILY OR LAST NAME (Print) Mr. <u>THOMAS</u> Mrs. _____ Present Address (Print) <u>221 SALMON STREET, POKEVILLE 12, ONTARIO</u> <small>(Give complete mailing address, including City and Province)</small>		CHRISTIAN OR FIRST NAMES (Print) <u>FRASER</u>	
PROVINCE OF RESIDENCE ON 31st DECEMBER, 1962: SAME AS PRESENT ADDRESS <input checked="" type="checkbox"/> OR PROVINCE OF _____		DATE OF BIRTH <u>16</u> <u>APRIL</u> <u>1920</u> <small>(Day) (Month) (Year)</small>	
STATUS ON 31st DECEMBER, 1962 <input checked="" type="checkbox"/> MARRIED (CHRISTIAN OR FIRST NAMES OF WIFE (HUSBAND) <u>MARY JANE</u> (ADDRESS OF WIFE (HUSBAND)) SAME AS ABOVE <input checked="" type="checkbox"/> OR <input type="checkbox"/> WIDOW(ER) <input type="checkbox"/> DIVORCED <input type="checkbox"/> SEPARATED <input type="checkbox"/> SINGLE			
NAME OF PRESENT EMPLOYER <u>POKEVILLE MOTORS LTD.</u> UNEMPLOYMENT INSURANCE NO. <u>1</u> TYPE OF WORK OR POSITION IN 1962 <u>ACCOUNTANT</u> NAME AND ADDRESS ON 1961 RETURN; SAME AS ABOVE <input checked="" type="checkbox"/> OR IF YOU DID NOT RESIDE IN CANADA FOR 12 MONTHS IN 1962, GIVE DATE OF ENTRY _____ OR DEPARTURE _____ <small>(Immigrants and Emigrants—Refer to the Guide for information as to the calculation of your tax.)</small>			
<h3 style="text-align: center;">Income</h3> SALARIES, WAGES, BONUSES, PENSIONS (Before Income Tax or Pension Deductions) NAMES OF ALL EMPLOYERS IN 1962 <u>POKEVILLE MOTORS LTD.</u> ..... Explain if the total months employed is less than 12 _____ Taxable allowances received from employer - - - Taxable benefits received from employer - - - Tips, gratuities, casual earnings - - - Old Age Security Pension - - - Dividends from taxable Canadian corporations (attach list) <u>500.00</u> Interest (attach list) - - - Alimony or separation allowance received - - - Other income (specify) _____ <b>TOTAL \$14,000.00</b>		<h3 style="text-align: center;">Calculation of Tax</h3> FEDERAL Income Tax on taxable income— See "Rates of Federal Income Tax" in Guide - <u>\$1,857.28</u> Add: Tax Adjustments—(See Guide, and specify) _____ <b>TOTAL Income Tax \$1,857.28</b> Less: Dividend Tax Credit—See Guide <u>\$500.00</u> Amount of Credit <u>100.00</u> (Amount of Net Dividends) BASIC TAX \$1,757.28 Less: Federal Tax Abatement applicable to persons resident in any province on 31st December, 1962—16% of "BASIC TAX" - <u>281.16</u> <b>FEDERAL Income Tax \$1,476.12</b> Add: Old Age Security Tax—3% of "TAXABLE INCOME" or \$90, whichever is less - <u>90.00</u> <b>FEDERAL TAX PAYABLE \$1,566.12</b> Add: PROVINCIAL Income Tax for province of residence on 31st December, 1962, if other than Quebec - <u>281.16</u> (See Guide) <b>TOTAL TAX PAYABLE \$1,847.28</b> Less: Tax deducted per T4 slips <u>\$1,987.20</u> Tax paid by instalments <u>4,987.20</u> <b>BALANCE—Enter in proper space below - \$139.92</b> PAYMENT ATTACHED _____ BALANCE UNPAID _____ OR _____ REFUND CLAIMED <u>\$139.92</u> PAYMENT—Any unpaid balance of tax is due not later than 30th April, 1963. Attach cheque (exchange not required) or money order made payable to the Receiver General of Canada. Do not mail cash. Postage stamps are not legal tender.	
<h3 style="text-align: center;">Deductions</h3> Registered pension plan contributions - <u>\$1,080.00</u> Registered retirement savings plan premiums—Attach Receipts - - - Alimony or separation allowance paid to _____ (Name and Address) _____ Other deductions _____ (See Guide, and specify) <b>Total of above deductions \$1,080.00</b> <b>DEDUCT: NET INCOME \$2,920.00</b> Total Personal Exemptions (Complete Page 2) <u>\$3,175.00</u> Medical Expenses, Donations, Dues (See Guide) Claim either A or B below (not both) <u>\$787.40</u> <u>\$3,962.40</u> A—Standard Deduction of \$100 (no receipts required) B—Total of Allowable Amounts Below Total medical receipts—Attach List and Receipts <u>\$50.00</u> Less 3% of "NET INCOME" - <u>87.60</u> Allowable portion of medical expenses <u>\$362.40</u> Charitable Donations—Attach Receipts <u>\$425.00</u> Annual union, professional or like dues paid to _____ (Name of organization) <b>TOTAL \$787.40</b>		<b>TAXABLE INCOME \$8,957.60</b>	

I HEREBY CERTIFY that the information given in this return and in any documents attached is true, correct and complete in every respect and fully discloses my income from all sources.  
 SIGN HERE Thomas Fraser  
 Date April 30, 1963 Telephone 359-4219  
 It is a serious offense to make a false Income Tax Return.  
 Form authorized and prescribed by the Minister of National Revenue

## WORKOUT EXERCISE III

Obtain from the post office, or the Department of National Revenue in your own taxation centre, a supply of T1 Short Individual Income Tax Returns. Fill in a form for each of the individuals in Workout Exercises I and II.

## Figure 9-5 Form T1 Short, Income Tax Return, Back

PAGE 2

## Claim for Personal Exemptions

ALL SPECIFIED DETAILS MUST BE PROVIDED FOR EACH EXEMPTION CLAIMED

- If this is wife's return, read "husband" for "wife".
- Income of your wife or dependants includes Old Age Security Pension or Assistance.
- No claim may be made for a child or other dependant whose income in 1962 was over \$950, except as noted below.\*
- If you are claiming dependants who did not reside in Canada, complete and attach form T1E-NR, which is obtainable at any District Taxation Office.

BASIC EXEMPTION - - - - - CLAIM \$1000 \$1,000.00

AGE EXEMPTION: If you were born in 1897 or earlier - - - - - CLAIM \$500 - - - - -

MARRIED OR EQUIVALENT EXEMPTION — If applicable, check ☒ and claim ONLY ONE of these six items

Married on or before 31st December, 1962 and

☐ Supported in 1962 wife whose income in that year, while married, was NOT OVER \$250 - - - - - CLAIM \$1000☒ Supported in 1962 wife whose income in that year, while married, was OVER \$250 but not over \$1250 - - - - - \$ 1 2 5 0

NOTE: If your wife's income while married was over \$1,250 in 1962, you may not claim either the married exemption or the equivalent exemption below

less wife's income \$ 475CLAIM \$ 775

Single, Divorced, Separated or Widow(er) in 1962 and

☐ Supported a wholly dependent child under age 21 or any age if infirm or in full-time attendance at a school or university. Complete "DETAILS OF DEPENDANT" space! and CLAIM \$1000☐ Supported a wholly dependent person related by blood, marriage or adoption and living in a dwelling maintained by you. Complete "DETAILS OF DEPENDANT" space! and CLAIM \$1000☐ Supported, jointly with one or more other persons, in a dwelling maintained by you and such persons, a wholly dependent relative. (You may claim here ONLY if it has been agreed that no other person will claim for the same dependant or in respect of the same dwelling.) Complete "DETAILS OF DEPENDANT" space! and CLAIM \$1000

Also, state the name and address of each other person who contributed to support—

☐ An unmarried minister or clergyman in charge of a diocese, parish or congregation in 1962 who maintained a dwelling and employed therein a full-time servant - - - - - CLAIM \$1000

† DETAILS OF DEPENDANT (Name - - - - - Address - - - - -)

(Income in 1962 \$ - - - - - Relationship to you - - - - -)

If a child, state age and, if over 21, state school attended or whether infirm.

## EXEMPTION FOR WHOLLY DEPENDENT CHILDREN (including grandchildren)

Under age 21 or any age if in full-time attendance at a school or university or if infirm.

Provide details of children wholly dependent upon you in 1962 and claim \$300 for each child "qualified for Family Allowances" (generally, any child under 16—see Guide) and \$550 for each child not so qualified. If any child under the age of 16 in December 1962 was not qualified for Family Allowances, state the reason

Name of child (Attach list if space insufficient)	Relationship to you	Income in 1962	Age in 1962	If over 21 in 1962 state school attended or whether infirm
JAMES	SON	\$1400	19	
HARRY	SON	\$25	16	
NORMAN	SON		13	

550.00

550.00

300.00

If you have claimed an exemption of \$1000 on account of a wholly dependent child you MAY NOT claim for that child here unless you supported the child in a dwelling wherein you employed a full-time servant. If you did, state servant's name here.

## EXEMPTION FOR OTHER DEPENDANTS—PARENTS, GRANDPARENTS, BROTHERS OR SISTERS (including in-laws)

Provide details below and claim actual amount spent in 1962 in support of each dependant (not exceeding the allowable maximum of \$300 if the dependant was qualified for Family Allowances or \$550 if the dependant was not so qualified). If any other person has also contributed to the support of a dependant listed here, the combined amount claimed by you and such other person must not exceed the maximum of \$300 or \$550 mentioned above. No claim may be made here for a dependant over age 21 who is not mentally or physically infirm, or for a dependant in respect of whom you have claimed an exemption of \$1000.

Dependant's Name and Address	Relationship to you	Income in 1962	Age in 1962	Amount spent by you in support of dependant	If over 21, state whether infirm
		\$		\$	

TOTAL PERSONAL EXEMPTIONS—ENTER ON PAGE 1 \$3,175.00

\* If it is to your advantage, you may claim an exemption for a child or other dependant whose income in 1962 exceeded \$950 but the amount by which such income exceeded \$950 must then be added to your own tax as a Tax Adjustment on Page 1.

## Questions for Discussion:

1. What is the authority for the deduction of income tax, and how is it administered?
2. How and when is income tax paid by the average wage earner?
3. How does an employer know how much to deduct from an employee's pay for income tax?



4. What are the regulations about a wife's income?
5. What is net income? Which of the deductions uses this figure to calculate the allowable deduction? How is it used? Give an example.
6. What is the taxable income? How is it computed?
7. When would you use the basic \$100 exemption and when would you submit receipts?

**Figure 9-6 Taxable Income in Excess of \$3,000**

**(a) Federal Rates**

1962 RATES OF FEDERAL INCOME TAX			
TAXABLE INCOME		TAX	
\$ 1,000 or less		11%	
1,000	\$ 110 + 14% on next		\$ 1,000
2,000	250 + 17% on next		1,000
3,000	420 + 19% on next		1,000
4,000	610 + 22% on next		2,000
6,000	1,050 + 26% on next		2,000
8,000	1,570 + 30% on next		2,000
10,000	2,170 + 35% on next		2,000
12,000	2,870 + 40% on next		3,000
15,000	4,070 + 45% on next		10,000
25,000	8,570 + 50% on next		15,000
40,000	16,070 + 55% on next		20,000
60,000	27,070 + 60% on next		30,000
90,000	45,070 + 65% on next		35,000
125,000	67,820 + 70% on next		100,000
225,000	137,820 + 75% on next		175,000
400,000	269,070 + 80% on remainder		

Taxable Income \$.....	
On the first \$.....	Tax is \$.....
On remaining \$.....	Tax at ____% is \$.....
Federal Income Tax \$=====	

**(b) Provincial Rates**

**PROVINCIAL INCOME TAX—RATES**

Provincial income tax, based on the province in which you resided on 31st December, 1962, is payable at the following rates:

- (a) Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Ontario, Alberta and British Columbia—16% of the "Basic Tax".
- (b) Manitoba\* and Saskatchewan—22% of the "Basic Tax".

\*Including Hospital Services Tax.



## SECTION 4 Provincial Tax Credits

The taxing powers of the Federal Government are unlimited, but the taxing powers of the provinces are limited to *direct* taxation; that is, they can only tax a person who will pay the tax himself. This includes income tax, retail sales tax, and succession duties.

However, since 1941 most of the provinces have made an agreement to withdraw from certain tax fields and allow the tax to be collected by the Federal Government. In compensation for the loss of income, the Federal Government makes annual payments to the provincial governments. Five-year agreements are signed and, at the time of writing, only the Province of Quebec collects income tax.

Provincial taxes are collected in the same way as federal taxes and carry a similar income and deduction structure, although the rates differ somewhat. A person residing in a province which collects income tax must fill in and pay federal taxes as well as the provincial tax.

A person residing in Quebec will not add the provincial income tax when calculating his tax on the individual income tax return (see figure 9-4), but will instead file a separate return for the calculation of the provincial tax.

### WORKOUT EXERCISE IV

Use figure 9-6 for the following problems:

1. Saul Abbot earns a salary of \$12,500 and receives dividends from Canadian corporations of \$750. His total deductions are \$2,400. Calculate his federal income tax payable and his total tax payable.
2. Carol Jamieson earns a salary of \$8,500. She receives bond interest of \$450 a year and Canadian corporation dividends of \$975 a year. She supports her mother who is totally dependent upon her and lives with her. How much income tax would Carol Jamieson pay to the Federal Government? How much is her total tax payable?
3. Arnold Farmer earns \$6,910 as an office manager. He supports a wife and two children under sixteen. His wife earns \$410 a year, and he has income from Canadian corporations amounting to \$350 a year. How much federal income tax does he pay?
4. Peter Archer has an income of \$5,000 from his employment, \$250 from bonds, and \$215 from dividends in Canadian corporations. He supports a wife and four children of ages 17, 16, 14, and 12. His wife has a personal income of \$310 a year, and the oldest child earns \$550 a year for a part-time, after-school job. How much federal income tax does Mr. Archer pay?

5. William Stanley earns \$5,420 a year and supports a wife, who earns \$735 a year, and four children, aged 16, 14, 10, and 6. He also receives \$75 a year as dividends from a Canadian corporation. To how much does his federal income tax payable amount?

6. Arnold Taylor receives a salary of \$6,845 as a chief accountant. His income from Canadian corporation dividends amounts to \$176. His wife earns \$483 for part-time work. He has six children: Bertha, 19, independent and working; Joseph, 17, at high school and earning \$650; Brenda, 15; Paul, 13; Stephen, 12; and Dotty, 9. His medical bills for the year totalled \$417, and he donated \$75 to charity. How much federal income tax did he pay?

## SECTION 5 Corporate Income Tax

Income tax is paid by limited companies on the net taxable income which is the gross income less the allowable deductions. The tax is levied on the fiscal year's earnings of the company, but the company is required to pay monthly instalments throughout the year. The *fiscal* or financial year is any year that is convenient and natural for a business to use as compared to the January 1 to December 31 calendar year. A business may wish to close its books and prepare its financial statements when its transactions are at their lowest point; say, the end of August. Its accounting or fiscal year would then be September 1 to August 31. A tax return form, T2, must be filed with the Department of National Revenue within six months after the end of the company's tax year or, in this instance, before the end of the following March.

The income tax payable is 21% on the first \$35,000 and 50% in excess of \$35,000 (3% old age security tax is included in both these rates).

*Example:* The Bennett and Sons Company Limited find, after preparing their annual profit and loss account for the year 19-5, that the company has made a profit of \$47,394. How much income tax do they have to pay?

21% of first \$35,000	\$ 7,350
50% of remaining \$12,394	<u>6,197</u>
Total income tax payable	<u>\$13,547</u>

As a limited company must pay tax instalments on a monthly basis throughout the year, it is necessary to estimate the profit for

the year and use this estimation to calculate the monthly instalment. The instalments commence six months before the end of the fiscal year and end six months after the end of the fiscal year. When the real income is known, an adjustment will be made; the adjustment must be made in the sixth month after the end of the fiscal year.

*Example:* On the basis of past experience, the Bennett and Sons Company Limited estimated their annual profit for the year 19-5 would be \$41,330.

- (a) To how much will the 11 monthly instalments amount?  
 (b) To how much will the 12th monthly instalment amount when their true profit is known?

(a) Estimated income tax:	
21% of first \$35,000	\$ 7,350.00
50% of remaining \$6,330	3,165.00
Total estimated tax	<u>\$10,515.00</u>
11 monthly instalment payments, 1/12 of \$10,515	<u>\$ 876.25</u>
(b) Total income tax payable	\$13,547.00
Less 11 instalments of \$876.25	9,638.75
12th instalment	<u>\$ 3,908.25</u>

## WORKOUT EXERCISE V

Calculate the monthly instalment payment, the actual income tax payable, and the amount of the tax payable in the sixth month after the end of the fiscal year in the following cases:

<i>Estimated Profit</i>	<i>Actual Profit</i>	<i>Estimated Profit</i>	<i>Actual Profit</i>
1. \$ 37,028	\$ 34,290	2. \$ 24,683	\$ 29,416
3. \$103,424	\$120,618	4. \$ 38,029	\$ 41,633
5. \$ 76,474	\$ 63,819	6. \$ 34,718	\$ 36,320
7. \$ 29,416	\$ 38,114	8. \$ 53,798	\$ 49,872
9. \$ 47,428	\$ 31,753	10. \$350,918	\$375,485

## SECTION 6

### Depreciation

We have already learned the sections of the profit and loss statement. We are now told that the limited company must pay income tax on the gross profit, less the allowable deductions. The allowable deductions are, generally, those expenses which are incurred in the

normal operation of the business; such as, wages, salaries, rent, heat, light, telephone, and many others.

One of the most important expenses that a limited company, or any other business, is allowed to deduct is *depreciation*. Depreciation is the amount by which an asset of the company depreciates or diminishes in value each year as a result of the asset's contribution to the operation of the company.

### Straight-Line Method of Depreciation

The straight-line method of depreciation divides the cost of the asset, minus any expected sale or scrap value, by the number of useful years of service the asset is expected to give. It is a method commonly used by companies.

*Example:* Let us assume that the Bennett and Sons Company Limited purchase a delivery van for \$6,000. They estimate the truck will serve them for 5 years and that then they will sell it for \$1,000. We can calculate the yearly "expense" of owning the truck as follows:

Cost of truck	\$6,000
Estimated scrap value	<u>1,000</u>
	<u>\$5,000</u>
Yearly expense, $\$5,000 \div 5$	<u><u>\$1,000</u></u>

The \$1,000 can thus be charged each year as the expense of owning a delivery van with which to deliver the company's sales. The company's profit and loss account might be as follows: .

**Figure 9-7**

*Bennett and Sons Company Limited  
Statement of Profit and Loss  
For the Year Ended December 31, 19-1.*

Sales .....	\$65,000
Cost of sales .....	<u>35,000</u>
Gross profit .....	\$30,000
Operating costs	
Wages .....	\$10,000
Light, heat, and power .....	2,500
Miscellaneous .....	8,100
Depreciation of building .....	300
Depreciation of fixtures .....	710
Depreciation of truck .....	<u>1,000</u>
Total operating expenses	<u>22,610</u>
Net profit	<u><u>\$ 7,390</u></u>

### Diminishing-Value Method of Depreciation

A second method of calculating depreciation is to decide what percentage of the asset will be used up each year and reduce the diminished value of the asset by this same percentage each year.

*Example:* The Bennett and Sons Company Limited purchased on January 1, 19-1, some new machinery costing \$10,000. They are to charge depreciation at the rate of 20% per year on the diminishing balance. What amount of depreciation would they charge in each of the first four years, and what would the net or book value be at the end of the fourth year?

Cost of machinery, January 1, 19-1	\$10,000
Depreciation, December 31, 19-1. 20% of \$10,000	<u>2,000</u>
Book value, December 31, 19-1	\$ 8,000
Depreciation, December 31, 19-2, 20% of \$8,000	<u>1,600</u>
Book value, December 31, 19-2	\$ 6,400
Depreciation, December 31, 19-3, 20% of \$6,400	<u>1,280</u>
Book value, December 31, 19-2	\$ 5,120
Depreciation, December 31, 19-4 20% of \$5,120	<u>1,024</u>
Book value, December 31, 19-4	<u>\$ 4,096</u>
Depreciation expense: 1st year	\$2,000
2nd year	1,600
3rd year	1,280
4th year	1,024
Book value end of 4th year	\$4,096

### WORKOUT EXERCISE VI

1. The Dapple-Grey Cartage Company depreciate their assets as follows:

Building, cost, \$90,000; 2% per annum, straight-line.

Furniture and fixtures, cost, \$20,000 in January 19-2; 15% per annum on a diminishing balance.

Trucks: #1, cost, \$6,000 in 19-1; #2, cost, \$4,000 in 19-2; #3, cost, \$5,500 in 19-0. The scrap value of these trucks is expected to be: #1, \$600 after 6 years of service; #2, \$500 after 4 years of service; #3, \$750 after 5 years of service.



Calculate the depreciation on each asset as at December 31, 19-4, and the total depreciation expense.

2. The sales reported for the year 19-4 for the Dapple-Grey Cartage Company were \$91,550. In addition to depreciation other expenses were: purchases, \$11,070; wages, \$23,780; telephone, light, heat and power, \$3,764; repairs and maintenance, \$1,176; miscellaneous expenses, \$936. The inventory on January 1, 19-4, was \$15,073 and was \$2,161 lower on December 31, 19-4. From this information draw up a profit and loss statement in correct form as at December 31, 19-4.

Calculate the following depreciation expense charges calculated on the straight-line basis and the book value of the asset after 9 years:

	<i>Cost of Asset</i>	<i>Scrap Value</i>	<i>Years of Service</i>
3.	\$ 12,500	\$ 1,750	20
4.	\$1,037,298	\$375,000	40
5.	\$ 77,000	\$ 29,000	15
6.	\$ 315,763	\$ 17,560	12
7.	\$ 7,486	\$ 850	12
8.	\$ 5,793	\$ 1,020	15

Use the diminishing balance basis to calculate the following depreciation expense charges for the first 3 years and the book value of the asset at the end of the third year.

	<i>Cost of Asset</i>	<i>% Per Year Depreciation</i>		<i>Cost of Asset</i>	<i>% Per Year Depreciation</i>
9.	\$110,000	2%	10.	\$75,500	6%
11.	\$8,300	5%	12.	\$1,029,730	12%
13.	\$798,415	15%	14.	\$17,790	10%
15.	\$315,720	30%	16.	\$55,798	25%
17.	\$819,790	20%	18.	\$29,350	17½%
19.	\$198,500	12½%	20.	\$1,798,412	33⅓%

21. Machinery which cost \$12,500 was expected to have a useful life of 20 years and at the end of that time to have a scrap value of \$1,750. What annual rate of depreciation does this amount to? (Hint: Find the yearly depreciation charge by the straight-line method, and find what per cent this is of the original cost.)

22. Find the annual rate of depreciation, to two decimal places, for problems 3-8 inclusive.

23. A building cost \$180,000. The owners wish to write it off (that is, depreciate it) completely in 20 years. What rate of depreciation should they use?

24. A typewriter was purchased for \$240; it was to be used for 8 years and then sold for \$25. What rate of depreciation should be charged?

## SECTION 7 Capital Cost Allowance

A Canadian taxpayer is entitled to deduct from his profit, before it is taxed, a depreciation expense allowance for the fixed assets he uses to produce revenue. However, the taxpayer must use the diminishing-value method of computing this depreciation, and the Department of National Revenue publish a schedule listing the classes of property into which assets are grouped and the maximum allowance for each group. They call this *capital cost allowance*. Figure 9-8 gives a partial list of maximum allowances per tax year. After deducting the capital cost allowance from the asset, the balance is called the *undepreciated capital cost*.

**Figure 9-8 Capital Cost Allowances**

Group of Asset	Rate
Frame buildings .....	10%
Brick buildings .....	5%
Fire resistive buildings .....	2%
Automobiles, trucks .....	30%
Machinery .....	20%
Furniture and fixtures .....	20%

The preceding example of the diminishing-value method of calculating the depreciation of the machinery purchased by the Bennett and Sons Company Limited is the amount allowable for income tax purposes. If an addition to the class is made at any time during the year, this is added to the undepreciated capital cost at the beginning of the year. If any disposal of assets is made to the class during the year, this is deducted.

*Example:* On March 1, 19-5, the Bennett and Sons Company Limited purchased two new machines for \$6,000 each and sold an old machine for \$4,500. On September 15, 19-5, they purchased additional machinery for \$5,500. Calculate the maximum capital cost allowance for the year 19-5 on the machinery owned by the Bennett and Sons Company Limited for income tax purposes.

January 1, 19-5, undepreciated capital cost (from previous example)	\$ 4,096.00
Additions:	
March 1, purchase of 2 machines at \$6,000 each	12,000.00
September 15, purchase machinery	5,500.00
	<u>\$21,596.00</u>
Disposals:	
March 1, sale of old machinery	4,500.00
December 31, 19-5, undepreciated capital cost	\$17,096.00
Maximum capital cost allowance: 20% of \$17,096	<u>\$3,419.20</u>
January 1, 19-6, undepreciated capital cost	<u><u>\$13,676.80</u></u>

When all the assets in one class are disposed of and sold for more than the undepreciated capital cost, the Income Tax Department consider the asset has been over-depreciated, and the amount of excess must be added back to the company's profit. The company may charge it all back to profit in the year of sale, or may spread it over the five immediately preceding years during which the group of assets was held. The income tax for the five years is then recalculated and the balance owing paid. Conversely, if the proceeds from the sale of all assets are less than the undepreciated capital cost, the difference may be deducted from income, with certain restrictions.

*Example:* In January, 19-6, Bowden and Grove Company Limited decide to sell their machinery and purchase finished materials instead of machining the raw material. They sell their machinery for \$15,000. The undepreciated capital cost is \$13,676.80 at the time of sale. What, if any, adjustment would they have to make to their income statement for tax purposes?

January 1, 19-6, undepreciated capital cost	\$13,676.80
Sale of all assets in class	<u>15,000.00</u>
Excess depreciation charged to be added back to taxable profit	<u><u>\$ 1,323.20</u></u>

If their profit for the year was \$34,000, which method of adding it back should the company choose?

This can only be decided by an actual calculation of the excess tax to be paid under both methods and then electing the cheaper method.

Assume, for instance, the net profit in the preceding five years to be:

19-1 .....	24,380
19-2 .....	39,220
19-3 .....	41,250
19-4 .....	36,590
19-5 .....	42,750

and no change in the tax rate.

- (a) Add excess depreciated or recaptured capital cost back to the year's income.

Income for year		\$34,000.00
Tax on \$34,000	=	<u>\$7,140.00</u>
Excess		<u>1,323.20</u>
		<u>\$35,323.20</u>
Tax on \$35,000 (21%)	\$7,350.00	
50% on \$323.20	<u>161.60</u>	
	<u>\$7,511.60</u>	

Excess tax to be paid ( $\$7,511.60 - \$7,140$ ) = \$371.60

- (b) Add  $\frac{1}{5}$  of \$1,323.20 = \$264.64

	<i>Tax Paid</i>	<i>Recalculation of Tax</i>	<i>Amount Owing</i>
19-1 on \$24,380.00	\$5,119.80		
on \$24,644.64		\$ 5,175.37	\$ 55.57
19-2 on \$39,220.00	\$9,460.00		
on \$39,484.64		9,592.32	132.32
19-3 on \$41,250.00	\$10,475.00		
on \$41,514.64		10,607.32	132.32
19-4 on \$36,590.00	8,145.00		
on \$36,854.64		8,277.32	132.32
19-5 on \$42,750.00	11,225.00		
on \$43,014.64		11,357.32	132.32
Excess tax to be paid			<u>\$584.85</u>

It would therefore be cheaper to add back the excess depreciation in the one year 19-6.

It frequently occurs that a company will use the straight-line method of depreciating their assets for their own records and on their own books but will use the diminishing balance method for the calculation of their income tax payable. In this way the company has a more realistic view of its own financial situation, and, at the same time, fulfills its tax obligations to the government.

# WORKOUT EXERCISE VII

Calculate the maximum capital cost allowance for the fiscal year for income tax deduction in each of the following cases:

## Undepreciated

<i>Capital Cost Jan. 1</i>	<i>Additions During Year</i>	<i>Disposals During Year</i>	<i>Type of Asset</i>
1. \$438,172.70	\$10,000	—	Frame buildings
2. \$78,349.18	\$20,000	\$5,000	Brick buildings
3. \$375,819.20	\$105,000	\$79,068	Trucks
4. \$1,450,028.35	\$45,000	\$1,000,000	Machinery
5. \$3,029.76	\$5,000	\$2,019	Furniture
6. \$4,328.29	\$3,510	\$5,417	Fixtures
7. \$1,501,638.53	\$100,050	—	Fireresistive building
8. \$782.20	\$5,000	\$318	Machinery
9. \$3,849,916.22	\$217,038	\$100,500	Brick buildings
10. \$513,029,799.78	\$198,026,314.01	\$416,034,756.20	Buildings at 2%

11. The Presto Company sell their fleet of delivery trucks and have their delivery service performed by an outside agency. The undepreciated capital cost at the time of sale amounted to \$51,076.35, and the trucks were sold for \$60,000.00. The year's profit amounted to \$37,083. Profits for the last five years amounted to: \$31,071; \$35,796; \$33,329; \$36,498; \$38,476. Should the Presto Company add back all the overdepreciation to the present year, or should they elect to divide it evenly over the past five years? How much will they save by the method you choose?

12. Thomas Harrison Limited sell the machinery of one factory which has not proved profitable. The undepreciated capital cost of the machinery at the time of sale is \$10,072, and the price realized from the sale is \$17,728. Their profit for the present year is \$37,439. The profits for the five previous years were: \$30,462; \$35,383; \$38,047; \$31,557; \$36,001. If the company add back the excess depreciation to this year's profits, how much extra income tax must they pay? If they elect to adjust the five previous years' profits by adding back one-fifth each year, how much more income tax must they pay? How much less is the one than the other?

13. The Mason Kitchen Supplies Company discontinue their faucet manufacturing department and sell the equipment for \$27,500. The undepreciated capital cost at the time is \$20,500. This year's profits amount to \$35,800. The company has only been in operation for two previous years, and the profit was \$5,000 and \$6,500. (If the company



was only in operation 2 previous years, the excess depreciation may be divided by 2 and half added back to each year; 3 years,  $\frac{1}{3}$  may be added to each year; 4 years,  $\frac{1}{4}$  added to each year; 5 or more,  $\frac{1}{5}$  added to each of preceding 5 years.) How should the Mason Kitchen Supplies Company elect to pay their tax on the excess depreciation?

14, 15, 16. Draw graphs to compare the tax paid before the excess depreciation is added back and after the excess depreciation is added back for problems 11, 12 and 13 above.

## SECTION 8 Business Losses

### Loss-Carry-Over

When a taxpayer suffers a loss from the operation of his business in any one year, he may deduct the amount of this loss from the profit made in other years in the following manner:

1. Go back one year and, if a profit was earned in the preceding year, deduct the amount of the loss from this profit. File an amended income tax return and obtain a refund.
2. If the loss from the present year is still unabsorbed, it may be carried forward to the next following year and taken from the profit of that year. If still unabsorbed, it may be carried forward four more consecutive years.

It should be noted that the above sequence must be followed, including the filing of the amended return, and the full amount available must be used before any remaining loss is carried forward to the next eligible year.

*Example:* Balboa Products Company Limited had profits and losses, before deduction of capital cost allowances or income tax, for seven years as follows:

	<i>Profit</i>	<i>Loss</i>
19-1	\$15,000	—
19-2	—	\$11,000
19-3	6,000	—
19-4	7,500	—
19-5	7,500	—
19-6	—	5,000
19-7	9,500	—

Prepare a statement showing the minimum taxable income for the seven year period. Calculate to the nearest dollar.

<i>Balboa Products Company Limited</i> <i>Statement Showing Minimum Taxable Income</i> <i>For the Seven Year Period, 19-1 to 19-7 Inclusive</i>					
Year	Reported Profit or (Loss)	Capital Cost Allowance	Adjust Profit or (Loss)	Loss Carried Backward (b) or Forward (f)	Tax Inc.
19-1	\$15,000	\$6,000	\$9,000	\$9,000(b)19-2	0
19-2	(11,000)	4,800	(15,800)	—	0
19-3	6,000	3,840	2,160	2,160(f)19-2	0
19-4	7,500	3,072	4,418	4,418(f)19-2	0
19-5	7,500	2,458	5,042	{ 222(f)19-2 4,820(b)19-6	0
19-6	(5,000)	1,966	(6,966)	—	0
19-7	9,500	1,573	7,927	2,146(f)19-6	\$5,781

### Explanation:

In each case, first deduct the capital cost allowance for the year to arrive at the adjusted profit or loss for the year.

To calculate the next column, "Loss Carried Backward (b) or Forward (f)", proceed as follows: Note that the first loss occurred in 19-2 and amounted to \$15,800. According to the two rules, \$9,000 of it may be carried back one year to eliminate the profit for 19-1, and taxes for 19-1 are therefore reduced to 0. This leaves a loss of \$15,800 — \$9,00 = \$6,800. Carry this forward (five years if necessary) to 19-3 and eliminate the profit of \$2,160; to 19-4 and eliminate the profit of \$4,418. This leaves a loss from 19-2 of \$15,800 — \$9,000 — \$2,160 — \$4,418 = \$222. This amount of \$222 is deducted from the profit of \$5,042.

A further loss occurs in 19-6, and we proceed as before. First, carry back as much of the loss as possible, in this case it will be \$4,820, eliminating the remainder of the profit for 19-5. Second, carry the remaining loss forward; the remainder, \$2,146, is carried forward to 19-7 and reduces the profit for that year to \$5,781, on which amount the tax must be paid.

### WORKOUT EXERCISE VIII

1. Allen Manufacturing Company had a loss in 19-3 of \$17,800. If they had a profit the year before of \$2,220 and in the subsequent five years of: \$4,500; \$2,500; \$3,000; \$6,200; \$6,750; draw up a statement to show the adjusted taxable income if they take advantage of the loss-carry-over regulation.

2. Frame and Dobs Limited take advantage of the loss-carry-over regulation to eliminate a loss of \$19,080 which they suffered in 19-5. The profit the previous year was \$3,794, and in the subsequent five

years: \$4,329; \$4,786; \$5,473; \$3,001; \$7,479. Draw up a statement to show the necessary adjustments to their taxable income.

3. The Byrd and Byrd Company had a loss of \$3,790 in 19-1 and of \$4,728 in 19-5. In 19-0 they showed a profit of \$2,482 and in 19-2, 19-3 and 19-4 a profit of \$3,710; \$2,120; \$2,076 respectively. In 19-6 and 19-7 the profit was \$1,429 and \$3,042 respectively. Draw up a statement to show the minimum amount of taxable income for the years 19-0 to 19-7.

4. Fox Filters Limited had the following profits or losses: 19-0, profit \$7,890; 19-1, profit \$17,461; 19-2, loss \$23,127; 19-3, profit \$11,680; 19-4, loss \$10,782; 19-5, profit \$15,789; 19-6, loss \$28,468; 19-7, profit \$1,412; 19-8, profit \$8,179; 19-9, profit \$11,783. Prepare a statement to show the minimum amount of taxable income for each of the above years.

5. The Fraser Bauxite Company sell their fleet of trucks in 19-5 for \$20,000. The undepreciated capital cost at the time of sale amounted to \$15,000. The loss for the year amounted to \$17,400. The profits for the previous five years, 19-0 to 19-4 respectively, amount to \$7,400; \$8,500; \$6,300; \$10,100; \$9,400. Should the Fraser Bauxite Company add back all the excess depreciation in 19-5 or spread it back over five years? They have a profit in 19-6 of \$10,000. Calculate the amount of extra tax that must be paid or the tax saved with each method.

6. Abraham Goodhouse has the following profit and loss record: 19-1, profit \$36,120; 19-2, profit \$31,020; 19-3, profit \$40,760; 19-4, profit, \$41,460; 19-5, profit \$45,000; 19-6, loss \$34,165; 19-7, profit, \$50,000. In 19-6 he discontinued manufacturing product Z-5 and sold all his machinery for \$50,000. Its undepreciated capital cost at the time of sale amounted to \$35,000. Calculate the extra tax to be paid or the tax that would be saved under the two methods of paying the tax on the excess depreciation. Which method has the biggest saving?

7. Draw graphs to compare the taxable income before and after the loss-carry-over regulation is applied for any three of the above problems.

## SECTION 9 Tax Benefits in Sale and Lease-Back

Sale and lease-back contracts were taken up in Chapter 7. At that time it was stated that the company would enjoy a saving in their income tax.

Rent of land and buildings is a deductible expense before the company pays income tax on the profit made during the year. If the

company owns the real estate, they are allowed to deduct depreciation on the buildings only at a diminishing-value rate of from 2% to 5%, depending on the class of building.

Let us assume: (a) that a company owns property valued at \$500,000 (land, \$50,000, does not depreciate; building, \$450,000).

The maximum capital cost allowance would be:

$$1\text{st year} = 5\% \text{ of } \$450,000 = \underline{\underline{\$22,500}}$$

$$* \text{ Average over ten-year period} = \underline{\underline{\$17,000}}$$

(b) that a company leases the same property for an annual rental of \$40,000 which includes the amortization of the property. The normal assessment for leasing is approximately 8% of the value of the real estate.

The deductible allowance would be:

$$\text{Annual rental and amortization} \quad \underline{\underline{\$40,000}}$$

∴ Tax advantage under leasehold:

	<i>Allowable Deduction</i>	
	1st year	Average over 10 yrs.
For rent	\$40,000	\$40,000
For depreciation	<u>22,500</u>	<u>17,000</u>
Tax advantage	<u><u>\$17,500</u></u>	<u><u>\$23,000</u></u>

## WORKOUT EXERCISE IX

1. Why could there be a tax advantage from leasing a property rather than owning it?
2. What other advantages are claimed for the sale and lease-back?
3. What are some of the disadvantages of sale and lease-back?

Calculate the allowable deductions from income in the following cases under both methods and compare the first 3 years:

	<i>Value of Property</i>		<i>Capital Cost Allowance</i>	<i>Rent Under Sale and Lease-Back</i>
	<i>Land</i>	<i>Buildings</i>		<i>% of Property Value</i>
4.	\$10,000	\$60,000	2%	8%
5.	\$20,000	\$125,000	5%	8%
6.	\$15,000	\$195,476	5%	8½%
7.	\$25,000	\$1,798,000	3%	9%
8.	\$33,785	\$2,078,493	10%	8¾%

\* Calculation of this is left as an exercise for the reader.

## SECTION 10

## Figuring for Fun

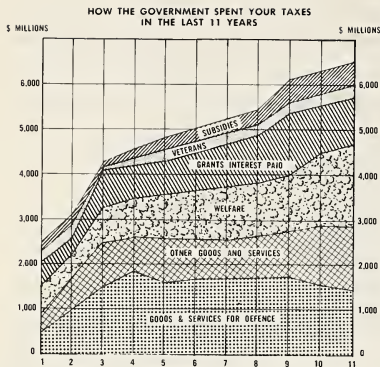
1. In the following combination each letter has a different value. What is the amount of the "tax"?

$$\begin{array}{r}
 \text{NET) INCOME (TAX} \\
 \text{ITOT} \\
 \hline
 \text{OTNM} \\
 \text{OAAT} \\
 \hline
 \text{HMAE} \\
 \text{HOIE} \\
 \hline
 \text{IOE}
 \end{array}$$

2. See if this one taxes you: If I add my income tax to the amount I earned before I deducted my income tax, I would have one and a half times as much as I have left after paying my income tax. If I paid \$1,000 income tax, how much did I earn?

3. Two small boys are rowing a very small boat on a river when a group of soldiers see them and want to be rowed across. However, the boat will only hold two small boys or one soldier. How do the soldiers get across using the boat?





# Taxation

## 10

### A Business Problem

The Walker Enterprises Limited recently purchased several acres of ground in a new subdivision and propose building a restaurant, bowling alley, and dance hall. They have asked you to prepare a report for them on the amount of municipal and business tax they will have to pay, the way the municipality spends the tax it collects, the facilities such as roads, hydro, sewage, and other protection that will be provided, and any regulations existing in the district which will apply to the activities they have in mind.

Governments raise money by means of various forms of taxation in order to operate and to offer services to the public.

## SECTION 1 Municipal Taxation

Local governments of cities, towns, and villages must provide fire protection and police protection; they must build and maintain schools, roads and sidewalks, and provide sewage, health, and social services. The treasurer of the local municipality will prepare a *budget* setting forth the expected financial requirements for the following year. This money must be raised, in part, from the people who will enjoy the services offered. This is done by charging, or *assessing*, property owners on the basis of the value of the real estate they own. The property is taxed by an officer called an *assessor*. A list, called an *assessment roll*, is prepared containing the names of the property owners in the municipality, the property they own, and the assessed value. The *assessed value* is usually a definite fractional part, or per cent, of the land owned. The land is taxed; buildings are not taxed separately but are considered as “improvements” to the land.

## The Tax Rate

Let us assume that the portion of the budget to be raised by taxation in Elmstown amounts to \$490,000. We will also assume that in Elmstown the assessed value of the property amounts to \$7,000,000. The \$490,000 expense must be divided pro rata among the property owners; i.e.,

$$\text{Tax rate per dollar} = \frac{\text{Amount of budget}}{\text{Assessed value of total real estate}} \quad (1)$$

In this case the tax rate per dollar will be:

$$\frac{490,000}{7,000,000} = \$0.07$$

This means the tax rate will be 7 cents for each \$1 of assessed value. Tax rates, however, are usually expressed as *mills per dollar* rather than as cents per dollar (1 dollar = 100 cents = 1,000 mills). In Elmstown, therefore, the tax collector must collect 70 mills per dollar to meet the budgetted expense.

*Example:* The budget for the town of Snowbank shows that the tax collector must collect \$175,000. The assessed value of the property in the town amounts to \$2,625,000. What tax rate must be charged?

$$\begin{aligned} \text{Tax rate} &= \frac{175,000}{2,625,000} \times \frac{1,000}{1} \text{ mills per dollar} \\ &= 66\frac{2}{3} \text{ mills per dollar} \end{aligned}$$

## The Tax Bill

Each taxpayer will receive a tax bill showing the assessed value of his property, the tax rate, the amount of the tax levied, and the date or dates on which the tax is payable. Many municipalities give a discount if the year's taxes are paid by the first due date, and almost all municipalities charge interest for late payment.

$$\text{Amount of tax} = \text{Assessed value of property} \times \text{Tax rate} \quad (2)$$

*Example:* The tax rate in Springton has been set at 45.7 mills per dollar payable in four equal instalments on March 31, June 30, September 30, and December 31. A penalty of one-half of one per cent per month, or part thereof, is imposed on taxes paid after due date, and 1% discount is allowed if any instalment is paid on the due date of a prior instalment.

James Crocus owns two pieces of property valued at \$25,000 and \$19,500, respectively, which are assessed at 60% of their

value. If James Crocus pays his total year's tax bill on September 30, calculate the amount of the cheque he must send the tax collector.

Assessment	=	60% of (\$25,000 + \$19,500)	
	=	60% of \$44,500	
	=	\$26,700	
Taxes	=	26,700 × 45.7 mills	
	=	1,220,190 mills	
	=	\$1,220.19	
Quarterly instalment	=	$\frac{1220.19}{4}$	= \$305.05
Penalty:			
Late payment, ½% of \$305.05	=	\$1.52525	
For 9 months	=	\$13.72725	
Discount for December payment paid ahead, 1% of \$305.05	=	\$3.0505	
Amount of cheque:			
Year's taxes		\$1,220.19	
Add: Late penalty		13.72725	
		1,233.91725	
Deduct: Prepayment discount		3.0505	
		<u>\$1,230.86675</u>	
	=	<u>\$1,230.87</u>	

Spending of the Tax Dollar

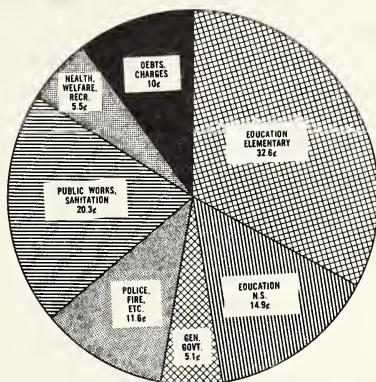
Tax payers are generally interested in knowing how the money collected is to be spent, and a typical breakdown for a small city is shown in figure 10-1.

Figure 10-1    How the Town of Fallburg Spent the Tax Dollar

EDUCATION	47.5¢	Elementary schools .....	32.6¢
		High schools .....	14.9¢
COUNCIL	52.5¢	General government .....	5.1¢
		Police, fire, and other protection .....	11.6¢
		Public works, sanitation, and waste .....	20.3¢
		Health, welfare, and recreation .....	5.5¢
		Debt and other charges .....	10.0¢

This information may also be presented in the form of a pie graph as shown in figure 10-2.

**How the Town of Fallburg Spent the Tax Dollar**



**Figure 10-2**

Source: Original

*Example:* If the total budget for the town of Fallburg is \$350,000, how much does Fallburg expect to spend on elementary school education?

For every \$1.00 collected	32.6¢
For \$350,000 collected	$32.6 \times 350,000¢$
Allotted for elementary education	<u><u>\$114,100</u></u>

More than 75% of the required revenue of any municipality is raised by property and business taxes. *Business tax* is an additional tax levied on every business enterprise. The base on which the taxation is calculated will vary according to the province, and sometimes the particular town, in which you live. The rate may be based on the floor area of the premises occupied, the amount of annual rental paid, a fraction of the original property assessment, or on an estimated yearly rental value. In some cases an annual licence fee of approximately \$200 is charged. An additional 5% of the revenue will be raised by other taxes such as sales and gasoline taxes. The balance of the revenue required will be received from provincial and federal grants and various other sources.

In most cases, property and business taxes are paid yearly. However, if the individual or business so wishes, arrangements can be made to pay more often if this is more convenient.

**WORKOUT EXERCISE I**

1. Why is it necessary for local governments to raise money?
2. How is the money raised?
3. Give an illustration of how the tax rate is determined for a particular municipality.
4. What information is usually given on a tax bill? How is the amount of tax payable computed?

Find the tax rate in mills for the following towns:

<i>Town</i>	<i>Value of Property</i>	<i>Assessed At</i>	<i>Required</i>
5. Flaville	\$4,076,000	65%	\$175,000
6. Redtown	\$6,384,900	30%	\$153,000
7. Brownburg	\$2,432,500	60%	\$95,000
8. Greenton	\$8,647,830	75%	\$365,100
9. Orangeacres	\$12,060,030	53%	\$547,000
10. Blue Corners	\$20,798,040	70%	\$930,200

Find the amount of tax for the following property holders:

<i>Person</i>	<i>Value of Property</i>	<i>Town</i>
11. Walter Wallace	\$35,000	Flaville
12. Peter Pecan	\$17,595	Redtown
13. Harry Hazelrod	\$37,815	Brownburg
14. Paul Pollach	\$27,089	Greenton
15. Barry Brazil	\$110,050	Orangeacres
16. Penny Pistachio	\$578,176	Blue Corners
17. Arnold Almond	\$48,180	Flaville
18. Horace Horn	\$257,078	Redtown
19. Charles Chesterfield	\$417,700	Brownburg
20. Colin Cox	\$8,397,428	Greenton

21. The tax rate in Abbeyville has been set at 43.8 mills per dollar. Albert Kingsley owns property valued at \$60,000 and assessed at 40% of its value. The tax can be paid in four equal instalments on March 31, June 30, September 30, and December 31. Late payments carry a penalty of  $\frac{1}{2}\%$  per month after due date, but if a payment is made on a prior instalment date to the due date, a discount of 1% is allowed on the amount paid. If Albert Kingsley pays his taxes on September 30 for the whole year, for how much must he make out the cheque? If he had paid it all on June 30, how much would he have paid?

22. Geraldine Turner owns property in Pinetown valued at \$20,000,



\$25,000, and \$40,500. All property is assessed at 37% of its value and taxed 39.5 mills on the dollar. The taxes can be paid in equal quarterly instalments on March 15, June 15, September 15, and December 15, and 1% discount is allowed for payments made at least 3 months in advance of the due date. Late payments carry a penalty of  $\frac{1}{8}\%$  for each month or part month they are overdue. If Geraldine Turner paid all the taxes on the \$20,000 property on March 31, all the taxes on the \$25,000 property on June 30, and all the taxes on the \$40,500 property on September 30, how much was each cheque made out for? How much more or less would she have paid in the year if she had met each instalment as it came due?

23. Bartonville's tax rate has been set at 79 mills per dollar and is to be spent as follows: general municipal purposes, 40 mills; debt charges, 5 mills; elementary schools, 22 mills; high school, 12 mills. Draw a pie graph to show this information.

24. Dellstown spends the money received in taxes as follows: education, 26.1%; health and welfare, 14.0%; police and fire, 11.7%; public works, 12.9%; debt charges, 22.5%; all other, 12.8%. Draw a pie graph to inform the tax payers how their tax money is spent.

25. Acreville collects \$897,420 in taxes and spends the money as follows: education, 34.9%; debt charges, 15.8%; police and fire, 11.8%; public works, 19.3%; health and welfare, 9.3%; general government, 5.9%. Draw up a table to show the amount spent under each category and a pie graph to illustrate this information graphically.

## SECTION 2      Excise Taxes

In the last section we learned how the municipality in which you live raises the money needed to govern your city, town, or village. The provincial governments also raise money to govern the provinces by income taxes, various sales and other taxes, succession duties, fees, permits, licences, et al.

Now we look at the highest level of government, the Federal Government. The Federal Government raises approximately 50% of the required operating budget from income taxes collected from individuals and corporations. It raises approximately another 10% from excise taxes. (This is in addition to the 11% sales tax.) An excise tax is an additional tax at the manufacturer's level on a number of luxury or semi-luxury articles manufactured in or imported into Canada and consumed in Canada. The amount of this tax varies with the commodity. The following is a typical but not a

complete list:

- 15% ..... radios, television sets, phonographs,  
record-players
- 10% ..... jewelry, cosmetics, smokers' accessories,  
chinaware, clocks, watches
- 7½% ..... automobiles
- Tobacco, 80¢ a lb.

These taxes are paid by the manufacturer to the Receiver General of Canada, and the amount of this tax is "hidden" in the sales price to the purchaser.

*Example:* The Fytone Corporation manufacture a television set at a cost of \$250. If they wish to realize a profit of 20% on cost on this television set, at what price must they sell it?

Cost to produce set	\$250.00
Required profit, 20%	50.00
	<u>\$300.00</u>
15% excise tax	45.00
Quoted price	<u>\$345.00</u>
11% sales tax, if sold to consumer	37.95
	<u><u>\$382.95</u></u>

In this example, the 15% excise tax is the "hidden" tax. When the customer buys the television set he will notice only that he is paying the sales tax of 11%.

## WORKOUT EXERCISE II

Calculate the excise duty on:

1. Radios, \$1,163.18; Record-players, \$735,712.18; Jewelry, \$30,028.15; Chinaware, \$73,078.22.
2. Television sets, \$38,069.29; Phonographs, \$75,392.19; Cosmetics, \$379,029.19; Ashtrays, \$819,028.15; Clocks, \$41,039,728.14; Watches, \$57,789.32.
3. Automobiles, \$78,029.39; \$109,384.76; \$11,938.41.
4. Tobacco, 3,029,799.39 pounds; Smokers' sundries, \$982,793.39.
5. Radios, \$37,829.14; Television sets, \$39,072.14; Clocks, \$27,429.18; Automobiles, \$74,039.93; Smoking sundries, \$34,683.86; Watches, \$22,424.84.
6. Automobiles, \$329,899.98; Radios, \$3,079.28.

Calculate the cost at which the following articles must be sold to retailers to realize the required profit to the manufacturer.

(No sales tax)

Article	Cost to Produce	Required Profit
7. Radio	\$19.70	20% of cost
8. Television	\$101.79	23% of cost
9. Watch	\$7.95	30% of cost
10. Clock	\$17.89	29% of cost
11. Radio	\$14.75	25% of sales price
12. Phonograph	\$23.79	28% of sales
13. Record player	\$41.27	35% of sales
14. Automobile	\$939.56	38% of sales

15. In a recent year the Federal Government collected approximately \$5,200,000,000 in taxes and other revenue. If 25.6% of these were collected from excise duties, sales tax and excise tax, how much (in dollars) was collected from this source?

16. In the same year 21.6% was collected from corporation income tax and 29.6% from personal income tax, the balance coming from other sources. State these amounts in dollars and draw a multiple bar to show the information graphically.

### SECTION 3 Custom Duties

The Federal Government also raises an approximate 10% of its budget by imposing a tax on many articles imported into Canada from foreign countries. This *custom* or *import duty* is levied in many instances to protect Canadian industries by restricting or excluding imports of certain commodities.

When goods are imported into Canada, they must be cleared through a Canadian Customs Office at the Port of Entry where they are classified, assessed, and where duty is paid by the importer — in accordance with a schedule of rates known as a *tariff*. There are three levels of duty:

(a) *British Preferential Tariff*, as its name implies, is used for imports from the British Commonwealth Countries.

(b) *Most-Favoured-Nations Tariff* is used for those nations with whom Canada has trade agreements, that is, all GATT Members (General Agreement on Tariffs and Trade, regulates four-fifths of the world's international trade).

(c) *General Tariff Rates*. Only a few nations fall in this group.

Of course, just as Canada has trade agreements with certain foreign countries to the exclusion of others, other nations have similar agreements among themselves which exclude Canada. An important example is the European Common Market.

*The European Common Market* is a community of nations brought together under the Treaty of Rome to facilitate the free flow of capital, labour, services and goods between member nations. The six member nations comprise: France, Belgium, Italy, West Germany, Luxembourg, and the Netherlands. The agreement became operative on January 1, 1958. It has a twelve-year plan divided into three four-year stages before complete freedom between the nations will be achieved.

The United Kingdom proposed an enlargement of the original six nations to seventeen nations, but this was abandoned. The United Kingdom together with Australia, Denmark, Norway, Portugal, Sweden, and Switzerland are members of a *Free Trade Association* to facilitate trade among their members. The United Kingdom, Norway, Sweden, and Denmark are also interested in joining the European Common Market.

The creation of these blocks has resulted in many problems for Canadian and American exporters as higher import duties are levied against non-members than against members.

### Types of Import Duty

There are two common types of duty:

(a) *Specific* duty, a direct tax levied on the quantity by weight, measure or number. The duty is charged as so much per pound, per foot, or per dozen.

*Example:* How much duty will be charged on 50 tons of coffee beans if the duty is \$.0075 per pound?

$$\begin{array}{lcl} 50 \text{ tons} & = & 50 \times 2000 \text{ pounds} = 100,000 \text{ pounds} \\ \text{Duty} & = & 100,000 \times .0075 = \$750 \end{array}$$

(b) *Ad valorem* duty, a percentage of the fair market value which is based on the price of similar goods for home consumption. Sometimes production cost, plus a reasonable profit markup, is used in the place of the fair market value.

*Example:* How much ad valorem duty will be charged on 60 cases of jewelry valued at \$15.00 a case if the duty is 25%?

Value of shipment	=	\$60 × 15	=	\$900
Amount of duty	=	25% of \$900	=	<u>\$225</u>

If the imported goods are to be used in the manufacture of goods in Canada which are, when processed, to be exported out of Canada, a *drawback* of 99% of the duties or taxes may be allowed. This same 99% drawback applies if goods are imported and subsequently exported to a third country.

*Example:* If the jewelry imported in the last example is packaged and exported to a foreign market, how much drawback of the original duty could the company claim?

Amount of duty paid	=	\$225
Amount of drawback, 99% of \$225	=	\$222.75

### WORKOUT EXERCISE III

1. Explain what is meant by an import duty and a tariff.
2. Describe the principal levels of duty and their importance to Canadian importers.
3. Who are the original members of the European Common Market? What are they trying to accomplish? Try to collect some information about the development of a large trading block.
4. Explain what is meant by, and give an example of, specific duty and ad valorem duty.
5. Describe an example of how a drawback functions.

*Exchange rates for problems 6 to 16:*

1 pound sterling	\$3.01 England, Scotland
	\$2.4275 Australia
	\$2.9071 The Bahamas, Bermuda
1 franc, France	\$0.2102
1 krone, Denmark	\$0.1500
1 D. mark, Germany	\$0.2582
1 yen, Japan	\$0.002870
1 rupee, Pakistan, Ceylon	\$0.2180
1 krona, Sweden	\$0.1998
1 dollar, American	\$1.07375
1 lira, Italy	\$0.001664



Refer to the exchange rates given on the preceding page for problems 6 to 16.

6. Importobile Incorporated purchase automobiles as follows: From Bermuda, 37 at £827. 4s. 8d. each, tariff free; From Albania, 39 at \$1,426.89 each, tariff 27½%; From West Germany, 57 at 5,540 D. marks each, tariff 17½%. What was the total cost of automobiles from each country before sales tax? What was the company's expense after paying the 11% sales tax?

7. Fashion Sophisticates Limited imported the following summer cottons from England: 10 dresses invoiced at £3. 10s. 6d. each; 25 dresses invoiced at £5. 2s. 6d. each; 15 dresses invoiced at £2. 4s. 3d. each; 12 dresses invoiced at £1. 15s. 9d. each. The customs duty is 25%. The sales tax payable is 11%. How much did Fashion Sophisticates Limited pay, in Canadian dollars, for the total shipment?

8. Playtime Imports purchased cotton play clothes from foreign countries invoiced as follows: from America, \$3,069.28 American dollars; from France, 10,089 new francs; and from the Bahamas, £428. 17s. 2d. The tariff in each case is 25%. What was the total cost in Canadian dollars of the cottons from each country? What was the total bill after paying the 11% sales tax?

9. Foreign Auto Sales Company imported the following cars: the Ambleside from England, 21 cars priced at £897. 6s. 6d. each; the Vagonette from East Germany, 17 cars priced at \$1,426.59 each; and the Italiano from Italy, 27 cars priced at 2,107,682 lira each. The tariffs are: Commonwealth countries, free; Preferred Nations, of which Italy is one, 17½%; General Tariff, applicable to East Germany, 27½%. 11% sales tax applies. How much did the cars from each country cost the company before sales tax? How much did Foreign Auto Sales Company pay in total after sales tax?

10. New Vogue Furniture imported furniture from: Sweden, valued at 3,780 krona, tariff 25%; England, valued at £329. 19s. 3d., tariff 15%; East Germany, valued at \$428.49, tariff 45%. How much did the furniture cost from each country before sales tax? How much was the total bill after the 11% sales tax was paid?

11. The Dexter Manufacturing Company imported machinery into Canada of a type not manufactured in this country as follows: from Scotland, £800. 7s. 6d., free tariff; from France, 6,530 new francs, tariff 7½%, member of Favoured Nations; from Bulgaria, \$895.40, General Tariff, 35%. How much did the machinery amount to from each country before sales tax? How much was the total bill after the 11% sales tax was paid?

12. Assuming the machinery purchased by the Dexter Manufacturing Company in problem 11 is to be exported by them, how much drawback will the firm be entitled to?

13. The Spare Parts and Machine Importers imported machinery of a type that is manufactured in Canada from the following countries: from Australia, £78. 14s. 3d., tariff 10%; from Denmark, 845 kroner, tariff 22½%; from Romania, \$121.75, tariff 35%. How much will the machinery cost, before sales tax, from each country? How much is the total cost of the machinery after sales tax?

14. If the machinery imported by the Spare Parts and Machine Importers is used in the assembly of agricultural machines which are then exported to France, to how much drawback is the firm entitled?

15. Vista Camera Imports Limited imported the following cameras: from West Germany, 12 dozen at 76 D. marks each, tariff 15%; from Japan, 12 dozen at 10,500 yen each, tariff 15%; from Pakistan, 12 dozen at 175 rupees each, tariff 5%. Calculate the cost of importing the cameras from each country before sales tax? How much was paid in total after paying the 11% sales tax?

16. The West Brothers Company imported furniture as follows: from West Germany, 18,927.35 D. marks, 25% tariff, Preferred Nations Tariff; from Ceylon, 27,345.75 rupees, 15% tariff, British Commonwealth Tariff; from Monaco, \$17,834.28, 45% tariff, General Tariff nation. How much did the furniture cost from each country? What was the total cost to the company after paying the 11% sales tax?

17. If the total income received by the Federal Government was \$5,200,000,000 in one year and the revenue from customs import duties amounted to 9.9% of the total, how much was collected in customs duties? If it cost \$14,500,000 to collect this tax, what per cent of the total tax was the cost of collection?

18. Sources of Government revenue in millions of dollars for eight years were as follows:

Personal income tax	\$450; 500; 500; 660; 670; 550; 610; 660
Corporation income tax	\$350; 400; 330; 500; 550; 500; 500; 500
Excise duties and sales tax	\$1,100; 1,110; 1,050; 1,170; 1,220; 1,250; 1,200; 1,380
Customs import duties	\$1,200; 1,250; 1,000; 1,220; 1,200; 1,000; 1,110
Other revenues	\$1,200; 1,170; 1,170; 1,420; 1,500; 1,330; 1,550

Draw a component line graph to illustrate this tax revenue.

19. Federal income tax collections for six years amounted to:

<i>From individuals</i>	<i>From corporations</i>
\$ 652,329,000	\$ 711,577,000
1,225,276,000	1,266,557,000
1,284,348,000	1,060,149,000
1,525,450,000	1,335,637,000
1,499,894,000	1,075,878,000
1,751,581,000	1,234,216,000

Depict this information graphically in two different forms.

20. Federal Government collections in thousands of dollars by provinces for five years amounted to:

Ontario	600,544	1,297,788	1,543,903	1,332,348	1,540,761
Quebec	353,903	674,801	763,215	680,134	792,528
B.C.	131,588	236,284	287,022	252,275	298,389
Maritimes	50,333	102,195	118,821	99,162	118,229
Prairies	163,623	304,688	351,116	343,299	395,354

Draw a multiple line graph to depict this information. What is the percentage of increase in each province between the last and first years?

21. The specific duty charged on a shipment of dates was 17¢ a pound. The Gourmet Importers Limited paid a total duty of \$384.03 on one shipment. How many pounds did the shipment contain?

**SECTION 4     Other Taxes**

A further 1.5% of federal revenue is obtained through the taxation of the estates of people when they die. The provinces of Ontario and Quebec also levy a succession duty on estates. The balance of the federal revenue is obtained from various licences, services, sales, permits, and receipts from government enterprises.

*Gasoline Tax:* An important source of provincial revenue is obtained by levying a tax on gasoline. Each province has its own rate as shown in figure 10-3.

**Figure 10-3                      Gasoline Tax Rates by Provinces**

Alberta .....	10 cents	Ontario .....	13 cents
British Columbia .....	10 cents	Prince Edward Island ...	16 cents
Manitoba .....	11 cents	Quebec .....	13 cents
New Brunswick .....	15 cents	Saskatchewan .....	12 cents
Newfoundland .....	17 cents	Northwest Territories ...	1 cent
Nova Scotia .....	17 cents	Yukon .....	6 cents

In most provinces, if the gasoline is used for a purpose other than to propel a vehicle along the highway, a refund of the tax can be obtained. For instance, if you have an inboard or outboard motor boat using gasoline, you will pay the regular price for the gasoline, but at the end of the season you can apply for a rebate of the tax paid on the gasoline purchased.

#### WORKOUT EXERCISE IV

1. The revenues from gasoline taxes, in thousands of dollars, for the last six years were as follows:

Eastern Provinces:	\$20,453	13,218	27,335	29,390	30,780	31,715
Quebec:	\$57,109	60,251	68,564	78,726	85,490	86,250
Ontario:	\$87,151	93,630	104,895	114,135	141,450	146,500
Western Provinces:	\$57,760	61,767	66,845	76,584	84,180	86,160

Draw two types of graph to depict this information.

2. In the last year of the preceding table the gasoline tax represented the following percentage of total provincial revenue: Eastern Provinces, 14.5%; Quebec, 16.6%; Ontario, 24.2%; Western Provinces, 12.3%. How many thousand dollars did each province collect in total tax?

3. In one year the Federal Government collected the following sales tax and excise tax on automobiles:

<i>Month</i>	<i>Sales Tax</i>	<i>Excise Tax</i>
January	\$6,894,665	\$4,369,025
February	7,582,602	4,724,817
March	7,430,631	4,489,437
April	8,498,566	4,956,498
May	8,995,076	4,298,219
June	9,240,759	5,493,879
July	7,201,358	4,170,010
August	5,282,974	2,867,847
September	2,182,605	875,750
October	4,842,065	2,275,277
November	6,948,015	4,136,201
December	9,648,150	5,823,733

Draw a graph showing this information. If the sales tax is 11% and the average price of cars sold is \$2,500, how many cars were sold during the year?

4. Using figure 10-3 and the figures in problem 1 above, how many gallons of gasoline were sold in Ontario in each of the six years? How many were sold in Quebec in each of the six years? Draw a line graph to compare the gasoline consumption in the two provinces.

## SECTION 5 Figuring for Fun

### 1. More cryptography:

(a) Draw a rectangle and write the message in the normal sequence from left to right. For example, suppose the message is: "The escape to take place tonight as scheduled."

5	2	7	4	1	6	3
T	H	E	E	S	C	A
P	E	T	O	T	A	K
E	P	L	A	C	E	T
O	N	I	G	H	T	A
S	S	C	H	E	D	U
L	E	D				

(b) Transpose vertically, but first scramble the columns in accordance with a key; for example, 5,2,7,4,1,6,3. The message thus becomes:

STCHE    HEPNS    EAKTA    UEOAG    HTPEO  
SLCAE    TDETL    ICD

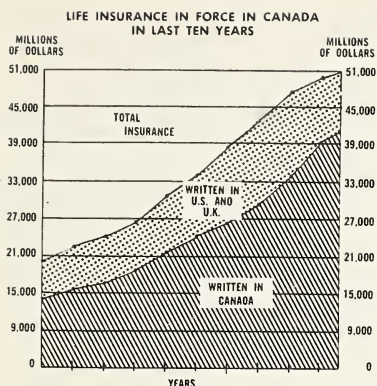
The vacant squares are not filled in as this would give a clue to the number of columns in the key.

(c) To decipher: Divide the total number of letters in the message by the length of the key; i.e.,  $\frac{38}{7} = 5$  with a remainder of 3. The remainder shows the number of letters in the last row of the rectangle. Thus, starting with the final letter "D", the cipher letters can be put back in their places and the message read.

Make up your own rectangular message and key. Try to solve one made up by a classmate.

2. A famous old problem involves twelve coins one of which is false and therefore either lighter or heavier. With only three weighings on a balance scale, you are to find the false coin.





# Life Insurance

## 11

### A Business Problem

Gerald Thornhill, aged thirty-five, is a salesman for Pryde Products Limited. He has a wife, three years his junior, and two daughters, aged three and seven. The Thornhills have just purchased a new home on which there is a \$10,000 mortgage. Mr. Thornhill feels he should take out insurance to protect his family and his home in case of his sudden death, to ensure his children's education, and to provide for his own retirement.

What is the best and cheapest way that he can provide sufficient money to pay off the mortgage and have enough to invest so that, if he died suddenly, his wife could continue to live in the house and educate the children? What type of insurance should be considered for his retirement years? What other considerations should he keep in mind?

The human race is subject to all kinds of calamities: sudden death, accident, fire, flood, burglary, and many other perils. Any one of these incidents could financially ruin an individual or a family. However, from the earliest times people found that if they formed groups to meet perils, the group was stronger and more able to cope with unexpected calamity than was the individual. This is the basic concept behind the formation of insurance companies; a large number of individuals (*policyholders*) pay small definite amounts (*premiums*) to protect themselves against some unpredictable occurrence. Thus each individual has a small known expense instead of the uncertainty of possible complete financial ruin.

### SECTION 1 Life Insurance and the Law of Averages

8,500,000 people in Canada own life-insurance policies totalling \$44,000,000,000 for which they pay over \$900,000,000 a year in life insurance premiums. The first life-insurance protection recorded appears to be the Roman burial clubs. Each member of the club was

assessed about \$3.50, several gallons of wine, and a further 5 cents a month. When a member died, the club paid for the burial services. This was later extended to include benefits to survivors. In the Middle Ages, when pirates roamed the seas, captains and their crews carried ransom insurance so that if they were captured their lives could be saved if ransom money were available.

Today, of course, life insurance is a highly specialized field. *Actuaries* calculate the amount of premium each policyholder must pay to maintain an adequate fund to pay out the required amount upon the death of a policyholder. To make this calculation, the actuary must know how long people may be expected to live. The *law of averages* tells us the chance or probability that an event will, or will not, happen. For instance, if you toss a dime, say ten times, you may get any combination of heads and tails: eight heads and two tails; three heads and seven tails; an unpredictable result. However, if you tossed the coin a hundred thousand times, your final result would always be very close to half heads and half tails.

This same law applies to new-born babies. No one knows how long a particular baby will live, but the law of averages applied by the actuaries can predict with high accuracy how many people of any given age will die in any particular year. Figure 11-1 shows a section of a *mortality table*. This table takes 100,000 children living

**Figure 11-1 American Experience Table of Mortality (in part)**

(1) Age	(2) Number Living	(3) Number Who Will Die	(4) Probability of Dying	(5) Probability of Living
10	100,000	749	0.007 490	0.992 510
11	99,251	746	0.007 516	0.992 484
12	98,505	743	0.007 543	0.992 457
13	97,762	740	0.007 569	0.992 421
14	97,022	737	0.007 596	0.992 404
15	96,285	735	0.007 634	0.992 366
16	95,550	732	0.007 661	0.992 339
17	94,818	729	0.007 688	0.992 312
18	94,089	727	0.007 727	0.992 273
19	93,362	725	0.007 765	0.992 235
20	92,637	723	0.007 805	0.992 195
30	85,441	720	0.008 427	0.991 573
40	78,106	765	0.009 794	0.990 206
50	69,804	962	0.013 781	0.986 219
60	57,917	1,546	0.026 693	0.973 307
70	38,569	2,391	0.061 993	0.938 007
80	14,474	2,091	0.144 466	0.855 534
90	1,402	555	0.454 545	0.545 455

at age 10 and traces their probability of living and dying through to 90 years of age.

Column (2) of this table shows the number of the original 100,000 ten year olds who are still living at the age noted in column (1). Column (3) shows the number of those living in column (2) who will die that year. Column (4) shows, at each age, the probability of dying in that year, and column (5) the probability of living one more year.

*Example:* Tom Taylor is 17 years old. What is the probability that he will live to be 18? The probability that he will die at 17?

The probability he will live, from column (5):

$$\frac{992,312}{1,000,000} \qquad 99:100$$

He has 99 chances out of 100 of living.

The probability he will die; from column (4):

$$\frac{7,688}{1,000,000} \qquad 7.7: 1000$$

He has 7.7 chances out of 1000 of dying, or 0.8 chances out of 100 of dying.

### WORKOUT EXERCISE I

1. Collect as much data as possible from a few of the large life-insurance companies and prepare a bulletin board display.
2. How old is the concept of insurance? See if you can find some examples of early insurance protection.
3. From figure 11-1 calculate your own probability of living another year and the probability of dying within the year.
4. What is the probability of (a) living another year and of (b) dying within the year for a person aged: 20, 30, 40, 50, 60, 70, and 80?
5. Draw a line graph to show the probability of living at ages 10, 20, 30, 40, 50, 60, 70, 80, and 90.

## SECTION 2 Term Life Insurance

There are basically three types of life-insurance policies, term policies, whole-life policies (including limited-payment life policies), and endowment policies. Each of these basic types, however, has many variations.

Term life-insurance policies are temporary policies and are the oldest type of life-insurance protection. As their name implies, they afford protection for a specified "term" of 1, 5, 10, or 20 years to a specified age. The benefit is only paid out if the insured person dies within the insured term; if the insured person lives to the end of the term, no benefit is paid. The premiums for this type of insurance policy are lower than for any other protection, and so this type of insurance is very valuable in helping to create a substantial estate quickly. A married man with a young family could thus give protection to his wife and family in the event anything should happen to him.

Term insurance can also be purchased for very short periods, shorter than one year. Indeed, one of the most common varieties of term insurance is that purchased by people planning a trip by aeroplane or by boat.

*Example:* From Table 5 at the back of the book, calculate the cost to persons of age 20 of a \$1,000, 5-year term insurance policy assuming money is worth 5% and benefits are paid at end of each year. Service charges are ignored.

At age 20, 92,637 persons are living.

	<i>Number dying</i>	<i>Benefits paid at end of year</i>
1st year	723	\$723,000
2nd year	722	722,000
3rd year	721	721,000
4th year	720	720,000
5th year	719	719,000

We must now find what these future payments are worth today (chapter 3, present value) and divide this required amount among the original group.

*Present Value*, Table 2 back of book.

1st year	\$723,000	$\times 0.952,3810$	=	\$543,971.46
2nd year	722,000	$\times 0.907,0295$	=	654,875.30
3rd year	721,000	$\times 0.863,8376$	=	622,826.91
4th year	720,000	$\times 0.822,7025$	=	592,345.73
5th year	719,000	$\times 0.783,5262$	=	563,355.35

Total amount to be collected = \$2,977,374.75

\$2,977,374.75 must be collected from 92,637 people at the beginning of the term.

$$= \frac{\$2,977,374.75}{92,637}$$

= \$32.14 per person is required.

*Example:* A \$5,000 policy of term insurance protection up to age 60 will cost: at 15 years of age, \$37.50 per year; at 21 years of age, \$41.00 per year; at 35 years of age, \$52.00 per year.

George Cowan took out \$15,000 worth of term insurance when he was 35 years of age. (a) How much per annum were his premiums? (b) How much term insurance would this annual premium have purchased at age 15? (c) If George died at age 50, how much would his widow receive? (d) If this amount is invested at 5% per annum, what will her income be?

(a) Annual premium at age 35 for \$15,000 = \$156.00

(b) At age 15, \$156.00 premium  
would purchase  $\frac{156.00}{37.50} \times \frac{5,000}{1}$   
= \$20,800

(c) His widow would receive on George's death \$15,000.

(d) Income on \$15,000 at 5% per annum = \$750

## WORKOUT EXERCISE II

1. What is "term" life-insurance protection? What are its advantages and disadvantages?
2. Using Table 5 and Table 2 at the back of the book, calculate the cost at the beginning of the term to persons aged 25 of a 5-year, \$5,000 term insurance policy. Money is worth 4½%, and all benefits are paid at the end of the year. Ignore service charges.
3. From Tables 2 and 5 calculate the cost at the beginning of the term, exclusive of service charges, of a \$10,000, 5-year term insurance policy to a person aged 30, if money is worth 6% and all benefits are paid at the end of each year.

Refer to this information for problems 4, 5, and 6:

At 15 years of age, \$37.50 per year buys a \$5,000, 45-year term policy.

At 21 years of age, \$41.00 per year buys a \$5,000, 39-year term policy.

At 35 years of age, \$52.00 per year buys a \$5,000, 25-year term policy.

4. Ernest Peabody is 35 years old and wishes to take out a \$15,000, 25-year term insurance policy. If he pays for it at the beginning of the term and money is worth 5%, how much will it cost, exclusive of service charges?



5. How much per annum would a \$25,000, 25-year policy cost at 35 years of age? What per cent less would a 45-year policy cost at age 15? What per cent more does it cost than a 39-year policy at age 21?
6. Colin Clark is 21 years of age and takes out \$27,500 short-term insurance protection up to age 60. How much per year do his premiums amount to? What per cent less per annum would he pay if he had obtained the same protection when he was 15? What per cent more will he pay per annum if he waits until he is 35 to obtain the same protection?

### SECTION 3      Whole-Life Insurance and Limited-Payment Life Insurance

*Whole-life insurance* is also called straight-life or ordinary-life insurance. Its characteristics are that it provides a lifetime protection; it has a savings or cash value at any time after the first few years and so may be used as collateral for borrowing money; premiums are spread evenly throughout a person's life. At the time of the insured person's death, the beneficiary will receive the face value of the policy.

Under a *limited-payment life insurance* policy, premiums are paid for a fixed period of time — for example, 15, 20, 25, or 30 years — until a specified age is reached. When the insured agrees to pay premiums for 15 years (or until his death) for a life policy of a specified value, we have what is called a 15-payment life policy; for 20 years, a 20-payment life policy; etc. At the end of the fixed period of time (15, 20, etc., years), assuming that the insured is still alive, he makes no more payments but is insured for the rest of his life. The beneficiary will receive the face value of the policy when the insured dies.

A limited-payment life policy costs a little more than a whole-life policy because the same benefits are received for payments over a shorter period of time. Many people prefer a slightly higher rate during their income-producing years. If premiums are paid semi-annually, the annual premium is multiplied by 0.52. If paid quarterly, the annual premium is multiplied by 0.265. Some policies also provide disability benefits which provide for the waiver of premiums and sometimes an income payment. A waiver of premium can be obtained by paying a slightly higher annual premium which under certain conditions waives the payment of premium during disability or other specified causes.

*Example:* Bill Wales is 20 years of age and wishes to take out a 20 pay-life policy for \$5,000. A whole-life policy at age 20 costs \$15 per thousand, a 20 pay-life at age 20 costs \$24 per thousand, and a 30 pay-life at age 20 costs \$18 per thousand.

- What annual premium must he pay?
- If he pays it quarterly, what are the quarterly payments?
- How much less per quarter would he pay for a whole-life policy?
- How much less per annum would he pay for a 30 pay-life policy?
- When he is 21 he takes out \$25,000 term insurance up to age 60. What will his total quarterly premiums now amount to?

---

(a) Annual premium	= \$24 × 5	= \$120
(b) Quarterly premium	= \$120 × 0.265	= \$ 31.80
(c) Whole-life		
policy premium	= \$15 × 5	= \$ 75
Quarterly premium	= \$75 × 0.265	= \$ 19.88
Payment would be	\$31.80 — \$19.88	= \$ 11.92 less
(d) Premium for 30 pay-life	= \$18 × 5	= \$ 90
Payment would be	\$120 — \$90	= \$ 30 less
(e) Premium for \$5,000 term policy at 21		\$ 41.00
Premium for \$25,000 term policy at 21		\$205.00
Premium per quarter	\$205 × 0.265	= \$ 54.33
Total quarterly payments	\$31.80 + \$54.33	= \$ 86.13

### WORKOUT EXERCISE III

- What is the basic difference between term insurance and whole-life insurance?
- What are the advantages and disadvantages of whole-life insurance and limited-payment life insurance?

Refer to this table for the problems that follow:

*Annual Premiums for \$1,000 Worth of Insurance*

Age at Issue	Whole-Life	20-Payment
15	\$13.50	\$23.10
20	15.75	25.55
25	17.80	28.33
30	20.25	31.61
35	24.71	35.45
40	29.41	39.92
45	34.93	45.21
50	42.68	51.92

3. When Patricia was 15, her parents purchased for her a \$5,000 whole-life policy. When she was 25, this policy had a cash surrender value of \$275, but at this time Patricia had a serious illness and had to cease working for five years. She had been paying an extra yearly premium of \$4.00 for a disability waiver of premium. How much yearly premium did Patricia pay? If she had not recovered from her illness but had died at age 33, how much would her beneficiary receive? How much would she have paid in premiums? How much would she have received if she had cashed in her policy when she was 28?

4. Trevor Jones purchased a \$10,000 whole-life policy when he was 25 years of age on which he paid a quarterly premium. He added a disability waiver of premium which cost him an additional \$7.50 a year. He had an accident when he was 33 which prevented him from working for 3 years. What amount of quarterly premium did Jones pay? How much had he paid in at the time he was injured? If he had died before he returned to work, how much would his beneficiary have received? If he had taken out the policy when he was 30, what per cent more per quarter would his premium have amounted to?

5. Paul Morganson, aged 50, and his son Robert, aged 25, both take out \$15,000 whole-life insurance policies at the same time. How much per quarter do they each pay? What per cent more does Paul pay than Robert?

6. John Henry, aged 30, and Robert Kane, aged 20, both take out \$12,000 whole-life policies. How much per quarter do they each pay? What per cent less per quarter does Kane pay than Henry?

7. Graham Sylvester, aged 45, purchased three 20-payment life policies for \$9,000 each for himself and his two sons, Robert, 15, and James, 20. How much was his quarterly payment? What per cent more did he pay for James' policy than for Robert's? What per cent less was the quarterly cost of his policy than the combined policy quarterly premiums of Robert and James?

8. Harry Peterson purchased an \$11,500 20-payment life policy for each of his daughters, Ruby 15, Sally 20, and Marjory 25. What total quarterly payment must he make? What per cent more does the policy for Marjory cost than the policy for Ruby? Than the policy for Sally?

9. Graham Cooke was 40 years old and planned to retire when he was 60. He would receive a pension from his place of business at that time, but he wished also to have \$10,000 in cash and \$2,500 to leave to each of his five children. He decided to take out a 20-pay-

ment life policy to give him this cash amount. How much per half-year will he have to pay for this policy?

10. Calculate the quarterly premium payments required to purchase the following 20-payment life policies:

<i>Age at Issue</i>	<i>Amount of Policy</i>
15	\$13,500
25	35,000
35	17,500
45	35,000

What percentage more is paid at 45 than at 25?

## SECTION 4 Endowment Insurance

As in limited-payment insurance, so in endowment insurance, premiums are paid for a fixed period of time. For example, under a 15-year endowment insurance policy, the insured agrees to pay premiums for 15 years or until his death, whichever occurs first. However, if the insured is alive at the end of the fixed period, he himself will receive the face value of the policy. Of course, after he has received the benefits, he is no longer insured. Should the insured die during the 15 years (or whatever the fixed period may be), the face value of the policy would be paid to the beneficiary.

This kind of policy enables a person to save for a definite project, such as a father saving for the college education of his son. As the face value of the policy is always paid at the end of the endowment period or on the death of the insured, whichever is earlier, the premiums on endowment insurance are higher than for other kinds of life insurance.

Figure 11-2 shows typical rates that are charged by life insurance companies for the different types of policies.

*Example:* Paul Grant took out a \$5,000 20-year endowment policy on each of his three children when they were twenty years old. If he paid the premium quarterly, what amount would he pay when all these policies were in effect?

---

Annual premium for \$1,000	\$51.54
Annual premium for \$15,000	\$773.10
Quarterly premium $0.265 \times \$773.10 = \$204.87$	

**Figure 11-2 Annual Premiums for \$1,000 Worth of Insurance**

Age at Issue	Term 20-yr.	Whole-Life	Limited-Payment 20-yr.	Endowment	
				20-yr.	Age 65
15	\$4.17	\$13.80	\$23.10	\$51.46	\$14.55
20	4.41	15.70	25.55	51.54	17.16
25	4.85	17.95	28.33	51.62	20.47
30	5.85	20.82	31.61	51.93	24.80
35	7.60	24.41	35.45	52.66	30.46
40	10.21	29.01	39.92	53.88	38.44
45	14.85	34.80	45.21	55.85	50.55
50	21.87	42.59	51.92	59.40	70.18
55	—	52.76	60.50	64.69	108.56

**WORKOUT EXERCISE IV**

- At the age of 25 George Collins took out the following insurance: \$20,000 term insurance, \$10,000 whole-life, and \$4,000 20-year endowment. How much did his quarterly premium amount to? What per cent more does he pay for \$1,000 of whole than \$1,000 of term? What per cent less does he pay for \$1,000 whole-life than \$1,000 20-year endowment?
- Sally Fraser, when she was 15, purchased a \$1,500 20-year endowment policy with money from her paper route. How much per quarter premium must she pay? If she invested the proceeds at  $5\frac{1}{2}\%$  and used the interest to purchase another \$1,500 20-year endowment policy paying for it yearly, how much would she have to add to the interest, if anything? What would her total capital be when the second endowment became due?
- Amos Jones is 35 years old and wants to ensure that he will have a pension of \$500 a month when he is 65. He will receive \$250 a month from his employment, and he wishes to purchase enough insurance so that the proceeds when invested at 6%, computed monthly, will bring his retirement income to the required amount. What kind of insurance should he take out and how much? What will his quarterly premium amount to?
- James and John, aged 20 and 25, respectively, both take out endowment policies payable at age 65 for \$10,000. What quarterly premium does each man pay? What per cent more does John pay than James? If they can invest the proceeds at  $5\frac{1}{2}\%$  per annum, how much more insurance would they need to purchase to bring their income up to \$962.50 per year? How much more per quarter would this additional insurance cost them?



5. Lionel Spratt is 30 years old and has 3 children. He wants to be able to leave each of his children \$5,000 and his wife \$20,000. How can he protect them immediately as cheaply as possible? What would it cost him per quarter for premiums? What per cent more would it cost him to purchase a whole-life policy for the required amount?
6. Graham Godrich is left a legacy when he is 35 which, when invested at 5%, pays him \$225 per quarter interest. How much was the legacy? If he uses the quarterly interest receipts to purchase a 20-year endowment policy, how much insurance could he buy? If at 55 he invests the proceeds of this policy at the same rate of interest and uses all his interest to purchase an endowment policy payable at 65, how much would his total capital amount to when he is 65? What monthly income will he receive if his total capital is invested at 6%, compounded monthly?
7. How much 20-payment life insurance, to the nearest hundred dollars, can be bought by Don Crabbe when he is 25 years old for a quarterly premium of \$95?
8. Fraser Dodge, age 30, decides he can spend \$150 each quarter on insurance. If he spends an equal amount on term insurance, 20-payment life insurance, and endowment insurance payable at 65, how much of each kind of insurance will he own?
9. Campbell Towne spends \$111.30 per quarter on insurance; \$23.37 for term insurance, \$47.57 for whole-life, and \$40.36 for endowment insurance payable at 65. How old was he when he took out each type of insurance, and how much of each type does he carry?
10. What per cent more does Roger, aged 45, pay for a 20-year endowment policy than Samuel, also aged 45, pays for an endowment policy payable at 65? At this particular age, which would be the better purchase? If they had both taken out the same coverage 10 years earlier, what per cent more would Roger be paying than Samuel? What advantage would he have for the additional premium?

## SECTION 5     Annuities

An annuity is a succession of periodic payments, such as \$100 a month for life after reaching the age of 65. This kind of insurance can also be purchased at any age for any sums to be paid periodically commencing at any desired age. According to statistics, women live longer than men, and so they must pay a higher premium for this type of insurance. Figure 11-3 gives a representative table. The rates will vary according to whether the purchaser wishes the payments guaranteed for a specified number of years. If payments are guaranteed for,

say 10 years, and the insured person dies before 10 years, the payments are made to the beneficiary for the remainder of the 10 years. The payments are of course continued to the insured person as long as he or she may live.

**Figure 11-3 Annual Premiums To Secure a Payment of \$10.00 Per Month**  
*Guaranteed for 10 years and for life thereafter*

Age	Male		Female	
	Age 60	Age 65	Age 60	Age 65
20	34.60	26.75	37.75	29.35
21	35.95	27.70	39.20	30.40
22	37.25	28.60	40.65	31.40
23	38.70	29.60	42.20	32.45
24	40.15	30.65	43.80	33.60
25	41.75	31.60	45.55	34.75
30	50.85	37.80	55.55	41.65
35	64.30	46.10	70.45	50.65
40	84.80	58.25	93.10	64.25
45	117.20	77.15	128.55	84.70
50	181.85	105.50	200.15	116.70

### WORKOUT EXERCISE V

1. Paul Johnston, now aged 25, wishes to have an income of \$100 a month when he is 65. What annual premium would he have to pay to purchase an annuity for this amount? If money can earn 6%, compounded monthly, how much endowment insurance, payable at 65, would he have to buy to give him the same income? How much per annum premium would he pay for this type of insurance? What per cent more is this than the annuity? What are the advantages and disadvantages of both types?

2. Trevor Matthews provides in his will that a sum of money be invested so that his son and his daughter will receive an income of \$500 a month when they are 60 years of age. If the son is 40 and the daughter 30 when Matthews dies, how much would need to be invested, if money is worth  $5\frac{1}{2}\%$ , for the necessary premiums to purchase these annuities?

3. What per cent more does a female pay at age 20 than a male of the same age for an annuity starting at age 60? What per cent more does she pay at age 50 than her male contemporary for an annuity starting at age 65?

4. Abraham Dolittle wishes to have a sum of \$20,000 and an income of \$150 a month when he is 65. What insurance should he take out, and what quarterly payments would he have to make for each type if he is now 30 years of age?
5. Sally Martin is 40 years of age and will receive a pension of  $\frac{2}{3}$  of her present salary of \$450 a month when she is 65. She would like to bring this up to \$500 a month by purchasing an annuity. What quarterly payments would she have to pay for this annuity? How much would she have to save and invest at 6% compounded monthly to bring in the same income?
6. Thomas Peters at age 35 purchases \$20,000 20-year term insurance, \$20,000 whole-life insurance, and an annuity to pay \$250 a month when he is 60. If his premiums are paid quarterly, to how much do they amount?
7. Sarah Owens is 45 years of age and wishes to take out insurance to pay her \$500 a month when she is 65. How much per annum would she pay for an annuity to pay her this amount? How much would she pay for an endowment at age 65 sufficient to give her the same monthly income assuming money can be invested at 4%, compounded monthly?
8. Dennis Seller, aged 25, is undecided whether to purchase an annuity to pay him \$350 a month when he is 65, or to buy an endowment payable at 65 which, when the proceeds are invested at 5% per annum, payable monthly, will give him the same income. What per cent more will the latter type of insurance cost him? What are some of its advantages and disadvantages?

## SECTION 6      Terminating Premium Payments

After a policy (with the exception of a term insurance policy) has been in force for three years, it possesses a *cash surrender value*. This value increases the longer the policy is in force, until at the termination of the period it is equal to the face value of the policy. A policyholder may, at any time, cease premium payments and surrender the policy in exchange for this cash surrender value. Or he may cease premium payments but leave the cash surrender value of the policy to purchase a smaller amount of paid-up insurance.

The insurance company will also lend money to the policyholder to an amount equal to the cash surrender value of the policy. They will charge approximately the same rate of interest as the current bank rate and hold the policy as collateral. If a policyholder is in need of temporary financial aid, the insurance company will prefer

to lend him money rather than see him cash in his insurance benefits. Figure 11-4 is representative of cash values allowed on surrender of the policy, and also shows the value of the paid-up insurance should it continue in force.

**Figure 11-4                      Cash Surrender Values Per \$1,000**

Age at Entry	Years in Force	Whole-Life		20-Payment Life		20-Year Endowment	
		Cash Surrender	Paid-up Insurance	Cash Surrender	Paid-up Insurance	Cash Surrender	Paid-up Insurance
20	3	8	31	16	64	82	144
	5	17	63	47	176	159	262
	10	59	194	134	445	381	533
	15	120	349	251	729	659	782
	20	193	494	391	1,000	1,000	1,000
25	3	11	38	22	78	81	142
	5	24	79	57	190	159	261
	10	74	215	158	462	381	533
	15	150	383	288	737	659	781
	20	233	524	445	1,000	1,000	1,000

*Example:* When Albert Brown was 25 years old, he took out a \$5,000 whole-life insurance policy. When he was 35, he had an accident, was unemployed, and was no longer able to pay his premiums. If he cashed in his policy, how much would he receive in cash? To how much did his insurance benefits amount? What per cent of his benefits did he lose by cashing in his policy?

From figure 11-4:

Cash surrender value for \$1,000	= \$	74.00
Cash surrender value for \$5,000	= \$	370.00
Paid-up insurance value for \$5,000	= \$215 × 5	= \$1,075.00
Per cent of loss	= $\frac{\$1,075 - 370}{1,075} \times \frac{100}{1}$	= 65.58%

**WORKOUT EXERCISE VI**

How much will be received and what per cent of loss will be suffered if the following insurance policies are cashed in?

	Age taken out	Amount of policy	Type of policy	Years held
1.	20	\$10,000	Whole-life	3

	<i>Age taken out</i>	<i>Amount of policy</i>	<i>Type of policy</i>	<i>Years held</i>
2.	20	\$15,000	20-payment life	15
3.	25	\$ 7,500	20-year endowment	20
4.	25	\$ 3,500	20-year endowment	10
5.	25	\$12,500	20-payment life	5
6.	20	\$25,000	20-payment life	3
7.	25	\$20,000	Whole-life	20
8.	20	\$22,500	Whole-life	15
9.	20	\$15,500	20-year endowment	3
10.	25	\$19,500	20-payment life	10

11. Life insurance in force in Canada in the last three years, in millions of dollars, was as follows:

<i>Canadian Companies</i>	<i>British Companies</i>	<i>Foreign Companies</i>
\$24,560	\$1,170	\$10,765
27,696	1,333	11,845
30,418	1,555	12,676

Draw a multiple bar graph to illustrate this information.

12. The benefits paid out by the Canadian companies in thousands of dollars during the last six years were as follows:

Death claims	\$84,106	\$135,440	\$148,035	\$157,389	\$175,257	\$188,000
Endowments	34,535	36,883	44,091	45,454	37,477	47,000
Surrender values	52,790	75,153	98,793	98,870	109,252	120,000
Annuities	17,771	41,315	45,238	51,120	68,329	69,000

Depict this information by means of a graph of your own choice.

## SECTION 7

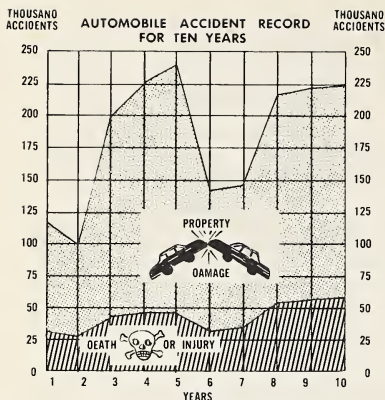
### Figuring for Fun

1. Two couples come to a river bank and wish to cross to the other side. There is a boat which will hold only two people and neither boy wishes to leave his girl with the other boy. How do they get across?

2. A farmer has a vessel filled with 8 quarts of milk which he wishes divided into two lots of 4 quarts each. He has two jugs which hold 5 quarts and 3 quarts, respectively. How can he transfer the milk so that he has 4 quarts in each of two containers?

3. If each child at a Christmas party were given three gifts, one child would receive only two. If, however, each child were given 2 gifts, there would be 8 left over. How many gifts would there be in all?





# Fire and Automobile Insurance

## 12

### A Business Problem

A weekend fire partly destroyed the main building of the Peters and Ross Plumbing Company resulting in a loss of \$50,000 which was considered to be one-half of the value of the building. On investigation you discover the company has the following fire insurance coverage:

- With Alpha Insurance, \$35,000 with 80% coinsurance clause;
- With Beta Insurance, \$25,000 with a 70% coinsurance clause;
- With Delta Insurance, \$10,000 with a 90% coinsurance clause;
- With Zenith Insurance, \$5,000 with a 100% coinsurance clause.

You have been asked to inform the Peters and Ross Plumbing Company how much they can expect to collect on their loss and to suggest any improvements in their fire insurance protection to adequately cover their property.

## SECTION 1      Fire Protection Insurance

All home owners and all businesses should insure their premises and contents against financial loss from destruction by fire. It would be impossible to obtain a mortgage on a home unless it was adequately covered by a fire insurance policy. The amount of insurance a fire insurance company will pay in the event of a fire will depend upon:

- (a) the value of the building at the time of the fire,
- (b) the amount of insurance carried on the building,
- (c) the type of insurance coverage carried.

It can never exceed:

- (a) the face value of the policy, or
- (b) the amount of damage done by the fire.

Fire insurance policies may cover one, two, three, four, or five-year terms; a three-year term is the most common for business

premises. Premiums are quoted on \$100 of coverage for one year and will vary from plant to plant according to:

- (a) location of the plant; its proximity to fire departments, fire hydrants, and the adequacy of its own protection services, such as watchmen, fire alarms, sprinklers, etc.,
- (b) exposure hazards, that is, any adjacent locations which could prove hazardous to the safety of the plant insured,
- (c) the construction of the building or buildings; higher rates apply on frame buildings; lower rates on fire resistive construction (steel and concrete) buildings,
- (d) the occupancy of the buildings; any hazardous processes conducted in the premises will increase the rate.

If the policy is to run for more than one year, the premium will increase each year by three-fourths of the first year's premium. Therefore, the premium for:

2 years is  $1\frac{3}{4}$  times premium for 1 year,

3 years is  $2\frac{1}{2}$  times premium for 1 year,

5 years is 4 times premium for 1 year.

The premium for the whole term must be paid when the insurance is purchased. Premiums on special risks equipped with automatic sprinklers are written for a one-year or a three-year term; the three-year premium is three times the one-year rate less 10%; or, the one-year rate is 37% of the three-year rate.

In arriving at a rate for an individual plant, the property is physically inspected. The first consideration is the city, town, or village in which the plant is located; each such location is assigned a "key" rate for all properties within its boundaries, depending, of course, on such things as fire department services and water supplies. To this basic key rate will be added charges for any features of the individual premises that add to the fire hazard, such as occupancy; e.g., paint spraying. Deductions will then be made for items which diminish the fire hazard; e.g., hourly watchman's service. Definite rules have been developed for these additions and subtractions to the basic key rate.

## WORKOUT EXERCISE I

Calculate the three-year premium on the following special risks. The rate quoted is per annum.

- |   |   |
|---|---|
| 1. \$500,000 at $25\frac{1}{2}\phi$ per \$100 | 2. \$1,250,000 at $21\frac{1}{4}\phi$ per \$100 |
| 3. \$575,150 at $27\frac{1}{2}\phi$ per \$100 | 4. \$93,575 at $24\frac{3}{4}\phi$ per \$100    |
| 5. \$48,176 at $35\phi$ per \$100             | 6. \$5,400,275 at $17\frac{1}{2}\phi$ per \$100 |
| 7. \$348,020 at $21\frac{1}{4}\phi$ per \$100 | 8. \$712,387 at $15\frac{7}{8}\phi$ per \$100   |

9. \$50,505 at 31¢ per \$100

10. \$97,219 at 28¾¢ per \$100

Calculate the two-year premium on the following risks. The rate quoted is per annum.

11. \$250,000 at 31¢ per \$100

12. \$18,753 at 33⅓¢ per \$100

13. \$59,780 at 29¼¢ per \$100

14. \$81,793,820 at 34¾¢ per \$100

15. \$1,039,550 at 35¾¢ per \$100

16. \$937,829 at 27⅞¢ per \$100

17. \$123,329 at 21¼¢ per \$100

18. \$797,656 at 23⅞¢ per \$100

19. \$10,921 at 28¾¢ per \$100

20. \$921,101 at 34⅜¢ per \$100

What is the annual premium per \$100 to two decimal places on the following sprinklered risks if the rate quoted is for 3 years?

21. 71¢

22. 69¼¢

23. 72½¢

24. 79⅜¢

25. 67⅔¢

26. 74⅞¢

27. 57⅜¢

28. 63⅞¢

29. 83¼¢

30. 91⅜¢

31. If an insured person has a fire, what factors govern the loss payable by the insurance company?

32. What factors must be taken into consideration when determining the premium rate to be paid? Why are these factors important?

## SECTION 2 Fire Losses

### Under an Ordinary Fire Insurance Policy

The insured person will be paid the full value of the fire loss up to the face value of the policy.

### Under a Coinsurance Fire Insurance Policy

The majority of fires do not cause a total loss; therefore there is a tendency on the part of insurers to insure only part of the value of the property, or enough to cover any probable partial loss. A company owning a building worth \$100,000 may feel that there is little possibility of more than 50% of the building being destroyed, and so insure it for only \$50,000. This custom, of course, is detrimental to insurance companies as they will collect premiums only on the values insured.

As a counter measure, and also to persuade companies to carry adequate insurance, the insurance companies introduce a *coinsurance clause* into their policies and with it, offer a lower rate. A coinsurance clause makes the insured company a coinsurer with the insurance company to the extent of the coinsurance named. This can be 60%, 70%, 80%, 90%, or 100%. The 80% is the most commonly used. Under a coinsurance clause the insurance company is liable for a loss up to the full value of the policy if the property is insured for not less than the percentage specified by the clause.

*Example:* The Lennox Steel Company own buildings valued at \$750,000. If they wish to insure them and take out a policy carrying an 80% coinsurance clause, for how much will the property be insured if it is fully protected? What is the amount of the total loss that can be collected?

---

Value of property	=	\$750,000
Required coverage 80% of \$750,000	=	\$600,000
Total loss that can be collected = face value of policy	=	\$600,000

---

The coinsurance comes into effect when the company do not carry the required amount of insurance. In the example above, the 80% coinsurance clause required the company to take out a policy for \$600,000. In this situation any loss up to \$600,000 would be paid in full by the insurance company. However, if the company had decided to take out a policy for only \$500,000, they would not have met the terms of the contract and would have become coinsurers in any fire loss suffered proportionately to the amount by which they are under-insured.

*Example:* The Jordan Glass Company own buildings valued at \$275,000. They take out insurance for \$200,000 under an 80% coinsurance clause. They later suffer a fire loss of \$12,000. How much will they receive from the insurance company in settlement of their claim? How much will the Jordan Glass Company lose?

---

Value of property	\$275,000
Required coverage to satisfy the 80% coinsurance clause	\$220,000
Face value of policy	\$200,000
Any fire loss will be paid:	

$$\text{By the insurance company, } \frac{200}{220} = \frac{10}{11}$$

$$\text{By the Jordan Glass Company, } \frac{20}{220} = \frac{1}{11}$$

Therefore in the fire loss of \$12,000:

$$\text{The insurance company will pay } \frac{200}{220} \times \frac{12,000}{1} = \underline{\underline{\$10,910}}$$

$$\text{The insured will lose } \frac{20}{220} \times \frac{12,000}{1} = \underline{\underline{\$ 1,090}}$$

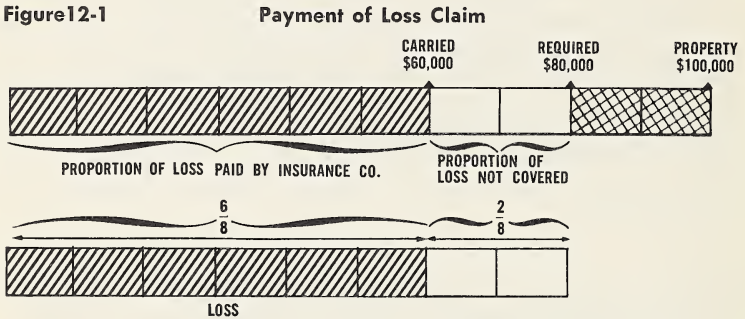
From the above example we see that the amount of any loss paid by the insurance company is the proportion of the insurance carried to the amount required to be carried:

$$\frac{\text{Amount of insurance actually carried}}{\text{Amount of coverage required to satisfy the coinsurance clause}}$$

We can restate this as an equation:

$$\text{Loss paid by insurance company} = \frac{\text{Insurance carried}}{80\% \text{ of property value}} \times \text{Total fire loss} \quad (1)$$

This is also shown in figure 12-1. In this example property is valued at \$100,000 with \$60,000 insurance carried under an 80% coinsurance clause.



The maximum that can be paid is always governed by the face value of the policy.

**WORKOUT EXERCISE II**

1. Explain in your own words the meaning of the coinsurance clause. Why is it important to insurance companies? To the insured person?
2. Draw a diagram to illustrate an under-insured risk and indicate how much of any fire loss would be paid by the insurance company. What factor will govern the maximum amount payable?
3. The Cameo Jewelry Company insure their property for \$170,000 under an 80% coinsurance clause. If the property is valued at \$225,000 and a fire does \$100,000 damage, how much will they collect from the insurance company? How much of the loss must they absorb themselves?
4. General Graphic Limited have property valued at \$1,078,020 which they insure under a 70% coinsurance clause for \$750,000. A fire destroys part of their plant and does damage valued at \$401,000. How much of this loss can they collect from the insurance company?
5. The Wellington Fire Insurance Company has to pay a fire loss on



property valued at \$150,000. The policy was carried under an 80% coinsurance clause for \$100,000. How much of the \$75,000 fire loss must they pay?

6. The Amiable Toy Corporation carry an ordinary fire policy for \$25,000 on building A, valued at \$40,000, and an 80% coinsurance policy for \$55,000 on building B, valued at \$83,000. A fire completely destroys building A and does \$35,000 damage to building B. How much will they collect from the insurance company for each building?

Find the amount of the loss that the insurance company will pay in each of the following instances:

	<i>Value of Property</i>	<i>Face Value of Policy</i>	<i>Coinsurance Clause</i>	<i>Loss</i>
7.	\$150,000	\$120,000	100%	\$70,000
8.	75,000	50,000	80%	15,000
9.	85,000	50,000	80%	31,000
10.	379,140	200,000	100%	107,000
11.	58,100	35,000	90%	17,500
12.	1,076,020	800,000	70%	53,400
13.	893,400	550,000	80%	303,600
14.	382,500	10,000	70%	73,180
15.	710,700	504,000	90%	18,400

16. Draw a graph to show the amount of a \$10,000 loss an insurance company would pay on property valued at \$90,000 and insured for \$50,000 under each of the following policies: regular fire policy; 100% coinsurance; 90% coinsurance; 80% coinsurance; 70% coinsurance; and 60% coinsurance.

### SECTION 3 Fire Losses Distributed Among Several Companies

#### Under an Ordinary Fire Insurance Policy

The property value of many modern business concerns is so large that one insurance company will not want to assume the total risk of the whole property, and the insurance will be distributed among several companies. In the event of fire damage, the amount of the loss is distributed among the insuring companies in proportion to the amount of each policy.

#### Under a Coinsurance Fire Insurance Policy

(a) *When coinsurance clause is satisfied.*

The claim is distributed in proportion to the insurance carried in the same way as under an ordinary policy.

*(b) When coinsurance clause is not satisfied.*

If sufficient insurance is not carried with one or more of the insuring companies to satisfy the coinsurance clause of the policy, the proportion of the loss paid by that company will be based on the required amount necessary to satisfy the clause, and not on the total amount carried as in (a) above.

*Example:* Sideacres Company place \$40,000 insurance under an ordinary policy with Alpha Fire Insurance Company, \$20,000 insurance with a 75% coinsurance clause with Beta Fire Insurance Company, and \$20,000 insurance with a 90% coinsurance clause with Omega Fire Insurance Company. If they have a fire loss of \$75,000, how much will each company pay?

Value of property to be insured	\$100,000
Amount necessary to be insured under 75% coinsurance	\$ 75,000
Amount necessary to be insured under 90% coinsurance	\$ 90,000
Amount actually carried: \$40,000 + \$20,000 + \$20,000	= \$ 80,000

Adequate insurance is carried with Alpha and Beta Companies; therefore use \$80,000 as the denominator of their proportionate loss.

$$\text{Alpha} = \frac{40,000}{80,000} \times \frac{75,000}{1} = \$37,500.00$$

$$\text{Beta} = \frac{20,000}{80,000} \times \frac{75,000}{1} = \$18,750.00$$

Adequate insurance is not carried with the Omega company, and so the Sideacres Company become coinsurers or, in other words, they must suffer their proportion of the loss on this policy. In this case, the denominator of the proportionate loss payment by Omega is \$90,000, the insurance necessary under the 90% coinsurance clause.

$$\text{Omega} = \frac{20,000}{90,000} \times \frac{75,000}{1} = \$16,666.67$$

Sideacres Company suffer the balance = \$ 2,083.33

This can be brought into a table. See figure 12-2.

It should of course be borne in mind that the *rate* paid will differ for each type of insurance carried.

Figure 12-2

Company	Coinsurance	Required Insurance	Insurance Carried	Proportion To Pay	Loss	Amount To Be Paid
Alpha	None	—	\$40,000	$\frac{40}{80}$	\$75,000	\$37,500.00
Beta	75%	\$75,000	20,000	$\frac{20}{80}$	75,000	18,750.00
Omega	90%	90,000	<u>20,000</u>	$\frac{20}{90}$	75,000	<u>16,666.67</u>
			<u>\$80,000</u>			<u>\$72,916.67</u>

WORKOUT EXERCISE III

Calculate the loss each insurance company will pay under ordinary fire policies if the following losses occur:

	Insurance Carried	With	Amount of Loss	Value of Property
1.	\$ 40,000	Alpha	\$ 88,000	\$100,000
	30,000	Beta		
	10,000	Omega		
2.	\$ 40,000	Alpha	\$ 88,000	\$100,000
	30,000	Beta		
	10,000	Omega		
	20,000	Delta		
3.	\$300,000	Alpha	\$500,000	\$1,000,000
	200,000	Beta		
	100,000	Omega		
4.	\$ 15,000	Alpha	\$ 15,000	\$ 75,000
	12,000	Beta		
	10,000	Omega		
	8,000	Delta		
5.	\$ 20,000	Alpha	\$ 40,000	\$ 75,000
	12,000	Beta		
	10,000	Omega		
	3,000	Delta		
6.	\$ 40,000	Alpha	\$ 90,000	\$125,000
	15,000	Beta		
	7,500	Omega		
	5,000	Delta		

7. In six recent years the premiums collected for fire insurance amounted to, in millions of dollars: \$59; \$120; \$152; \$153; \$164; \$190. The losses incurred amounted to: \$31; \$62; \$70; \$81; \$118; \$101. Draw

a multiple bar graph to show this information and a line graph to show the percentage of losses to premium for the years given.

Calculate the loss payable by each company under the following conditions:

	<i>Company</i>	<i>Coinsurance</i>	<i>Insurance Carried</i>	<i>Loss</i>	<i>Value of Property</i>
8.	Alpha	80%	\$ 40,000	\$ 40,000	\$100,000
	Beta	90%	20,000		
	Delta	70%	20,000		
9.	Alpha	none	\$ 75,000	\$ 90,000	\$250,000
	Beta	70%	50,000		
	Delta	80%	40,000		
	Omega	90%	25,000		
10.	Alpha	100%	\$ 40,000	\$ 60,000	\$ 95,000
	Beta	90%	20,000		
	Delta	80%	10,000		
	Omega	70%	6,000		
11.	Alpha	90%	\$ 90,000	\$ 75,000	\$357,500
	Beta	100%	80,000		
	Delta	none	20,000		
	Omega	70%	53,000		
	Zenith	90%	43,000		

## SECTION 4      *Automobile Insurance*

If you drive a car, it is very important that you carry the right kind and amount of automobile insurance. If you damage your own car or another person's car or property, it may involve costly repairs. If you cause injury to a person in your car or in another's car, it may result in large medical bills or perhaps a lawsuit.

The main types of automobile insurance are the following:

### *Public Liability*

This protects the car owner against loss arising from his liability for injury, sickness, or death to a pedestrian or any occupant of another car, resulting from an accident caused by his car, up to the face value of the policy. The different provinces vary in the minimum financial responsibility requirements. Some provinces set a minimum of \$10,000 for one person injured and \$20,000 for two or more persons injured. Other provinces set a minimum of \$20,000 for one person injured and \$40,000 for two or more persons injured. Individual car owners can, and often do, carry more than the minimum requirements.

### *Property Damage*

This protects the car owner from any claims resulting from damage caused to property by his automobile. The minimum protection required is \$5,000.

Public liability and property damage are written together and quoted as \$10/20/5,000 or \$20/40/5,000, as the case may be.

### *Collision*

This protects the car owner from damage to his car if it turns over, strikes, or is struck by another car or some object. The owner is covered whether he is at fault or not, and whether the owner of the other car is insured or not. Most collision insurance carries a deductible clause of \$50, \$100, \$150, \$200, or \$250. This means that the first \$50, or \$100, etc., is paid by the car owner, and the balance by the insurance company. The larger the deductible amount carried, the lower will be the premium paid.

### *Comprehensive*

This protects the car owner against loss or damage to his car caused by fire, theft, vandalism, falling objects, missiles, glass breakage, windstorm, hail, lightning, flood, smoke, and other causes listed in the policy. Some companies have a deductible clause of from \$5 to \$25, while other companies offer a full comprehensive coverage.

## **Automobile Insurance Rates**

Insurance rates vary according to:

(a) *Your locale.* Rates in each province will differ. Quebec rates are slightly higher than the rates of most other provinces; Montreal has one of the highest rates. Each province is further divided into districts; Ontario, for instance, has twelve such districts, each with a different rate. Rural districts have lower rates than densely populated districts.

(b) *Your classification.* There are three classifications:

- (1) The car is owned and driven by an adult over the age of 25.
- (2) The principal driver of the car is over 25, but the car is driven by a young adult under 25.
- (3) The principal operator is under 25.

(c) *The use to which the car will be put.* There are three classifications:

- (1) The car is used for business only.
- (2) The car is used to drive to and from work.
- (3) The car is used for pleasure only.



(d) *Your driving record.* There are four classifications:

- (1) You have had three, or more, accident-free years.
- (2) You have had two accident-free years.
- (3) You have had one accident-free year.
- (4) You have had less than one accident-free year.

(e) *The make and age of your car.* This category refers only to collision and comprehensive insurance and there are, of course, numerable classifications.

As can be readily imagined there are very many combinations of the above factors, and books of tables have been drawn up whereby a person in any category, in any place, owning any make and vintage of car, can be quoted a rate and be covered by insurance.

Figure 12-3 and figure 12-4 are two examples of typical tables of rates. For comparison purposes, two locales are taken, a metropolis in Ontario and a small urban town in Manitoba. One make of car is used, a Ford Fairlane Sedan, at two ages; first new within one year, and second over five years old. Three accident-free driving years are assumed. Rates for \$20/40/5,000 public liability and property damage are given in figure 12-3, and rates for a \$50-deductible clause for collision and full comprehensive coverage are given in figure 12-4.

**Figure 12-3 Rates for \$20/40/5,000 Public Liability and Property Damage**  
*Automobile insurance for a driver with 3 or more accident-free years.*

Locale	Class of Driver	Use of Automobile		
		Business only	To and from work	Pleasure only
Ontario metropolis	(1) Over 25	\$46.50	\$35.30	\$32.10
	(2) Over 25 + Under 25	57.80	57.80	57.80
	(3) Under 25	85.60	85.60	85.60
Urban town, Manitoba	(1) Over 25	\$23.90	\$18.20	\$16.50
	(2) Over 25 + Under 25	28.90	28.90	28.90
	(3) Under 25	43.90	43.90	43.90

#### WORKOUT EXERCISE IV

1. Name and describe the four main types of automobile insurance.
2. Why is it important for every car owner to carry adequate insurance protection? Can you think of reasons other than those given in the text?
3. Can you think of some reasons, other than those given, why the rates vary according to the district?

**Figure 12-4 Rates for \$50-Deductible Collision and Full Comprehensive Automobile insurance for a driver with 3 or more accident-free years.**

Locale	Class of Driver	Use of Car	Age of Car	
			New within 1 yr.	Over 5 years old
Ontario metropolis	Over 25	Business	\$60	\$40
		To and from	51	34
		Pleasure	46	31
	Under 25	Business	\$120	\$80
		To and from	120	80
		Pleasure	120	80
Urban town, Manitoba	Over 25	Business	\$62	\$47
		To and from	53	41
		Pleasure	50	38
	Under 25	Business	\$113	\$84
		To and from	113	84
		Pleasure	113	84

4. Do you think it is fair and reasonable that drivers under 25 should pay higher premiums? Support your answer with good reasons.

5. Why should the age and make of a car make a difference in the rates charged? Or the use to which you put the car? Or your driving record?

Refer to figures 12-3 and 12-4 for solving the following problems. In all cases, the car is assumed to be a Ford Fairlane Sedan, the driver is credited with three accident-free driving years, and full coverage is implied unless otherwise stated. Classifications of drivers and of use of car are to be made according to the three categories in the above tables. "District 1" refers to the Ontario metropolis, and "district 2" to the urban town in Manitoba.

6. Hazel Jackson, aged 18 and living in district 1, had a letter from a pen pal of the same age who lives in district 2. The pen pal stated that her father allowed her to drive his new car occasionally, but that in order to do this she must pay the extra premium on his automobile insurance. Hazel coaxed her father to allow her to do the same thing with his new car. How much more would Hazel have to pay than her friend in district 2? What percentage more would she have to pay? Both parents use their cars for pleasure only.

7. Colin Cramer and his son Colin Junior, aged 23, both own their own new cars in which they drive to work but otherwise use for pleasure. If they both live in district 1, how much more does Colin

Junior pay than his father? What percentage more than his father does he pay for public liability and property damage? What percentage more for collision and comprehensive?

8. John Kelly and his daughter Jackie, aged 18, both own old cars which they drive for pleasure only. If they live in district 2, how much more premium does Jackie pay to insure her car than does her father? What per cent more does she pay for public liability and property damage? What per cent more for collision and comprehensive? What per cent more for total insurance?

9. Tom Wilder, aged 22, owns an old car and lives in district 2. The following year he moves to district 3 and finds that he must pay  $112\frac{1}{2}\%$  more premium for public liability and property damage, and  $12\frac{1}{2}\%$  less premium for collision and comprehensive. How much premium must he pay? What per cent is this higher than his last year's premium?

10. Willie West in district 1, Wayne West in district 2, and Wesley West in district 5 are all over 25 years of age and have new cars which are used for business only. How much more insurance premium does Willie pay than Wayne? What per cent more premium for public liability and property damage? What per cent more for collision and comprehensive? If Wesley pays  $22\frac{1}{2}\%$  less than Willie for the public liability and property damage premium, and 5% less than Wayne for the collision and comprehensive premium, how much was his total premium? What per cent is this less than Willie's? What per cent more than Wayne's?

## SECTION 5      Figuring for Fun

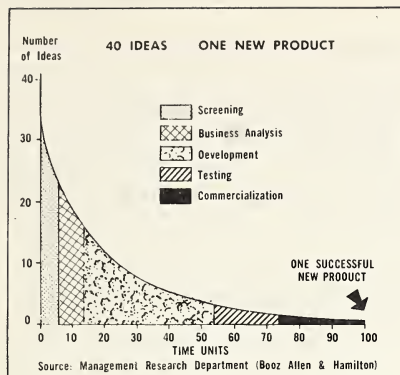
1. A number game for two people: Each takes a turn adding a number not greater than a predetermined number (say 7) to the number already named, with the object of reaching a predetermined number (say 65). The person reaching 65 is the winner. For example, Jennie says 6, and John adds 5, making 11; Jennie adds 7, making 18. The fun comes when the total is approaching 65. The object of course is not to let your opponent win; if your number adds to 58 or more, your opponent wins.

2. Can you find the smallest number that you can double, add 2, and end with your original number with the digits reversed?

3. A grain merchant always sells his grain in quantities ranging from one pound to forty pounds. If he has only four weights, what must they be in order for him to fulfill any order from one to forty pounds of grain?

# The Metric System

13



## A Business Problem

Executive Sweets Limited use approximately 15,000,000 paper-box cartons each year in which to pack their finished product. At present they purchase cardboard blanks and fold and assemble the boxes themselves. The cost of the blanks is \$24.50 per thousand. The floor space necessary to assemble and store cartons is 295 square metres.

A suggestion has been made to install a box-making machine at a cost of \$15,000 which will be depreciated over a 15-year period. The floor space needed will be 250 square metres for the machine and another 450 square metres for the storage of the cartons.

Space is estimated to cost \$5.00 per square metre, and the labour required is the same in both cases. A 10% increase in sales could be handled by the new machine with no increase in costs other than material used. Raw material necessary for a thousand cartons would cost \$8.00.

Would you advise Executive Sweets Limited to install the new machinery? Why? Point out the difference in cost and any advantages and disadvantages of the change.

The metric system is based on the unit measurement of the metre which was originally one ten-millionth of the distance between the North Pole and the Equator measured through Paris, France. A metal metre bar composed of 90 per cent platinum and 10 per cent iridium, known as the International Standard Metre, is preserved at the International Bureau of Weights and Measures at Sèvres, near Paris. Scientists throughout the world use this standard as the basis for all their linear measurements.

The metric system is also used in most countries for general linear measurements. There are still a few countries, mostly members of the British Commonwealth such as Canada, who do not use the metric system. These countries, including the United States, have often considered changing to the metric system because of its simplicity, and

some tentative attempts have been made to this end. It would, however, be a colossal task.

The metric system is important to anyone contemplating a career in business or the civil service. Complete familiarity with the system is especially important to anyone concerned with international trade, engineering, or any of the industries closely associated with the sciences.

## SECTION 1 Linear or Line Measurement

### The Metric System

Figure 13-1

<i>Metric Linear or Line Measurement</i>		
10 millimetres (mm.)	=	1 centimetre (cm.)
10 centimetres	=	1 decimetre (dm.)
10 decimetres	=	1 metre (m.)
10 metres	=	1 decametre (Dm.)
10 decametres	=	1 hectometre (Hm.)
10 hectometres	=	1 kilometre (Km.)
10 kilometres	=	1 myriametre (Mm.)

The units in common use are the millimetre, the centimetre, the metre and the kilometre.

Conversions can be made from one unit to another by multiplying and dividing by multiples of 10; in other words, by moving the decimal place to the right or to the left.

For example:  $6.32 \text{ m.} = 632 \text{ cm.} = 6,320 \text{ mm.}$

$166 \text{ mm.} = 0.166 \text{ m.}$

### WORKOUT EXERCISE I

1. How many pieces of cellophane tape, each 25 cm. long, can be taken from a roll  $1\frac{1}{4}$  kilometres in length?
2. How many pieces of street car track, each  $12\frac{1}{2}$  metres long, will be needed to lay a track 25 kilometres long?
3. Pierre can run 6,500 metres in 5 minutes; how many kilometres per hour is this? How many metres per second? How many seconds would he take to run 50 metres?
4. When Gigi Rousseau drives her car at 105 kilometres an hour, how many centimetres per second is she travelling?



5. A fence around a field is 285 metres long; how many centimetres of fencing are required? How many decametres?
6. Change the following measurements to centimetres: 1,800 mm.; 17 dm.; 10.63 m.; 10.85 Km.; 8.63 Hm.; 1138.62 dm.; 17.38 Dm.; 3.467 Mm.; 18.3 dm.; 14.82 Hm.
7. Change the following to metres: 38.6 Mm.; 82.639 dm.; 14.75 Hm.; 67.3 cm.; 497.45 Km.; 43.89 Dm.; 836.9 Mm.; 49.8 cm.
8. How many metres of wire will be required for a four-strand fence which is to be 31.16 Dm. long?
9. Measure the length and breadth of this page and of your notebook and express each in centimetres.
10. Measure the width and the length of your classroom and express in metres.

### Metric and British Equivalent Measurements

Figure 13-2

<i>Approximate Equivalents — Line Measurement</i>					
1 in.	=	2.54 cm.	1 cm.	=	0.3937 in.
1 ft.	=	0.3048 m.	1 dm.	=	0.328 ft.
1 yd.	=	0.9144 m.	1 m.	=	1.0936 yd.
1 mi.	=	1.6093 Km.	1 Km.	=	0.6214 mi.

### WORKOUT EXERCISE II

1. Change to millimetres: 2 in.,  $1\frac{1}{2}$  in.,  $4\frac{1}{4}$  in.,  $1\frac{1}{4}$  ft.,  $\frac{3}{8}$  ft.
2. Change to inches: 17 cm., 38 mm., 27 dm., 1 m.,  $1\frac{1}{4}$  m., 50 cm.
3. Change to kilometres: 5 miles,  $17\frac{1}{2}$  miles, 730 rods, 2 m., 1,000 yd., 3,500 yd.
4. Change to miles per hour: 25 ft. per sec., 450 cm. per sec., 1.5 metres per sec., 0.75 miles per sec., 0.842 Km. per sec.
5. Frank Fleetfoot ran the 500-metre race in 1 minute and  $12\frac{1}{5}$  seconds. How fast did he run in feet per second?
6. How many kilometres above the earth is an aircraft which is flying at an altitude of 30,000 feet?
7. Sarah is 5 ft. 2 in. tall, and Pierre is 1.909 metres tall. Who is the taller? By how many inches? By how many centimetres?
8. Cleopatra Dresses imported dress goods for which they paid \$2.95 a metre; how much per yard did the material cost them?

9. How much profit would Cleopatra Dresses make if they import 525 metres of silk goods for \$1.95 per metre which they sell for \$2.95 per yard?
10. How many miles is it from Berlin to Moscow if the distance is 1,603 kilometres?
11. "A miss is as good as a mile" would become: "A miss is as good as (how many) kilometres"
12. "I wouldn't touch that with a 10-foot pole" would become: "I wouldn't touch that with a (what length) metre pole".

## SECTION 2 Weights

### The Metric System

The metric unit of weight is the *kilogram*. The standard is a kilogram mass of platinum alloy preserved at Sèvres, France. The kilogram is divided decimally as shown in figure 13-3.

Figure 13-3

<i>Metric Weight</i>			
10 milligram (mg.)	=	1 centigram (cg.)	
10 centigrams	=	1 decigram (dg.)	
10 decigrams	=	1 gram (g.)	
10 grams	=	1 decagram (dcg.)	
10 decagrams	=	1 hectogram (hg.)	
10 hectograms	}	=	1 kilogram (kg.)
1,000 grams			
1,000 kilograms	=	1 metric ton (t.)	

The decagram and hectogram are seldom used.

### Metric and British Equivalent Weights

The approximate equivalents are shown in figure 13-4.

Figure 13-4

<i>Approximate Equivalents — Weights</i>			
1 ounce	=	28.35 grams	1 gram = 0.035 ounces
1 pound	=	453.59 grams	
1 pound	=	0.45 kilograms	1 kilogram = 2.205 pounds

**WORKOUT EXERCISE III**

1. Express in ounces: 1 ton,  $1\frac{1}{4}$  long tons,  $1\frac{1}{2}$  cwt.,  $6\frac{3}{8}$  lb.,  $18\frac{3}{4}$  lb.
2. Express in grams: 1,575 kg., 3,428 dg., 14,376.82 mg., 7,982.14 cg.,  $1\frac{3}{16}$  kg.,  $387\frac{7}{8}$  cg.
3. Express in pounds: 847.63 g., 3.78 kg., 78,429 cg.,  $4\frac{1}{3}$  kg., 1 metric ton.
4. Approximately 12,000 tons of water pass over Niagara Falls in one second. To how many kilograms per minute is this equivalent?
5. Paul Dawson weighs 182 lbs. If his three children together weigh 7.91 kilograms more than he does, how much do they weigh in kilograms? In pounds?
6. Chris Allen purchases 12 cartons of canned fruit. Each carton contains 2 dozen tins of fruit each weighing  $4\frac{3}{4}$  oz. The 12 cartons weigh  $6\frac{1}{2}$  lb. What is the total weight of the shipment in kilograms? How much will the total shipment cost if the fruit is 12¢ a tin and the freight charges are 61¢ per 10 lb.?
7. Import Stylists purchase 12 pieces of cloth from Paris each 55 metres long. The goods weigh 200 grams per metre. Import Stylists pay \$1.50 per yard for the material and pay ocean freight of  $2\frac{1}{2}$ ¢ per metre, inland freight of  $1\frac{1}{2}$ ¢ per lb., and duty of 50¢ per pound. How much is their total cost?
8. How many kilograms and grams will a shipment of 15 cartons, each containing 24 boxes of soap flakes, weigh if each box weighs  $13\frac{1}{2}$  ounces and the carton weighs  $3\frac{3}{4}$  pounds. If each box of soap flakes costs 39¢ and there is a freight charge of 56¢ per 10 lb., what is the cost of the shipment?
9. "It's all wool and a yard wide" would become?

**SECTION 3      Capacity — Liquid and Dry****Liquid Measure**

In the British system the unit of liquid measure is the *Imperial gallon*; in the United States, the *Winchester* or *wine-gallon*. In the metric system the unit is the *litre*. The two tables and their equivalent values are shown in figure 13-5.

**Dry Measure**

Dry measure is used in the British system to measure the volume of solids, such as seeds and grain, which are not sold by weight. As shown in figure 13-5, the units of dry measure for the British and

U.S. Standards are the same. The metric system utilizes the same units for liquid measure as for dry measure.

**Figure 13-5**

<i>Liquid Measure</i>			
4 gills (gi.)	= 1 pint (pt.)	10 millilitres (ml.)	= 1 centilitre (cl.)
2 pints	= 1 quart (qt.)	10 centilitres	= 1 decilitre (dl.)
4 quarts	= 1 gallon (gal.)	10 decilitres	= 1 litre (l)
		10 litres	= 1 decalitre (dkl.)
		10 decalitres	= 1 hectolitre (hl.)
		10 hectolitres	= 1 kilolitre (kl.)
<i>Liquid Measure — Equivalent Values</i>			
1 Imperial quart	= 1.136 l	1 U.S. quart	= 0.95 l
1 Imperial gallon	= 4.546 l	1 U.S. gallon	= 3.785 l
1 litre	= 1.76 Imperial pints	1 litre	= 1.0567 U.S. quarts
1 Imperial gallon	= 1.201 U.S. gallons	1 U.S. gallon	= 0.833 Imperial gallons
<i>Dry Measure</i>			
2 pints	= 1 quart	Metric — the same units as for liquid measure above	
4 quarts	= 1 gallon		
2 gallons	= 1 peck (pk.)		
4 pecks	= 1 bushel (bu.)		
<i>Dry Measure — Equivalent Values</i>			
1 quart	= 1.101 litres		
1 peck	= 8.810 litres		

## WORKOUT EXERCISE IV

(Note: Imperial measure is used unless otherwise stated.)

1. The gas tank of the Firebird holds 18 gallons of gasoline. How many litres of gasoline will it hold? How many Winchester gallons?
2. Tom Tracy exports 47,000 bushels of wheat to Spain. If he receives \$9.65 per kilolitre for the wheat, how much does he receive for the shipment?
3. There are 60 pounds of potatoes in a bushel. How many pounds of potatoes would be contained in a dry gallon? In a peck? In a kilolitre?

4. If one gallon of water weighs 10 pounds, what is the weight of  $19\frac{1}{4}$  litres of water?
5. Two quarts of oats occupy the space of how much liquid measure?
6. Express the Imperial gallon as a percentage of the wine-gallon. Express the U.S. gallon as a percentage of the Canadian gallon.
7. What per cent less is the American gallon than the Canadian gallon? What per cent more is the Canadian gallon than the American gallon?
8. A bushel of oats weighs 34 pounds. How many pounds of oats are contained in a litre? What per cent heavier are oats than potatoes? (See problem 3.)
9. Jacques Avoine shipped to France 57,000 bushels of oats. He received 15 francs a hectolitre in payment. If 5 francs are worth \$1, how much did Avoine receive for the shipment? How much per pound did he pay?
10. How much does a wine-gallon of water weigh? A U.S. quart of water? A litre of water? What per cent more does an Imperial gallon weigh than a U.S. gallon?
11. How many Imperial quarts are needed to fill a container which holds 62 litres of milk? How many U.S. quarts would fill the container? How many more U.S. quarts are needed?
12. Add: 3 cwt. 4 lb. 15 oz., 110 lb.  $3\frac{1}{2}$  oz., 56 kg., 115.68 kg. Express the answer: (a) in pounds, (b) in kilograms.
13. Add: 6 yd. 2 ft.  $5\frac{1}{2}$  in., 9 yd. 1 ft.  $3\frac{1}{4}$  in., 15 yd. 1 ft.  $11\frac{1}{4}$  in., 17.84 m., 7.42 Dm., 23.47 m. Express the answer: (a) in yards, (b) in metres.
14. Add: 10 gal. 3 qt. 1 pt. (liquid), 30.784 l (liquid). Give the answer in: (a) quarts and (b) litres.
15. Victor Stone took his station wagon when he went for a tour of Europe. When he left, he had 15 gallons 3 quarts 1 pint of gasoline. He carried and used a filled  $5\frac{1}{2}$  gallon can and purchased while he was there:  $62\frac{1}{2}$  l,  $63\frac{1}{4}$  l,  $61\frac{1}{2}$  l,  $54\frac{1}{8}$  l,  $62\frac{3}{4}$  l,  $59\frac{7}{8}$  l,  $65\frac{1}{8}$  l,  $54\frac{1}{2}$  l,  $59\frac{3}{4}$  l. If he had  $34\frac{3}{4}$  l remaining when he arrived home, how many litres of gasoline did he use? How many gallons? If he averaged  $4\frac{3}{4}$  miles per litre, how far did he travel?
16. La Piquant Robe Boutique purchase 15 pieces of cloth 50 metres long. If they make up dresses each requiring  $3\frac{3}{4}$  metres, how many dresses can be made up from the material purchased? How many yards are contained in the 15 pieces?
17. "I won't budge an inch" becomes?



## SECTION 4 Measurement of Area

Plane figures are figures that lie on a flat surface. They have length and breadth. *Perimeter* is the length of the boundary line around the outside of the plane figure. The school yard or the farmer's field form plane figures, and if you walk around the outside of either, you walk around the perimeter. The British system, the metric system, and a conversion table are shown in figure 13-6.

**Figure 13-6**                      **Tables of Square Measure**

<i>The British System</i>	
144 square inches (sq. in.)	= 1 square foot (sq. ft.)
9 square feet	= 1 square yard (sq. yd.)
30¼ square yards	= 1 square rod (sq. rd.)
160 square rods	= 1 acre (ac.)
640 acres	= 1 square mile (sq. mi.)
<i>The Metric System</i>	
100 square millimetres (sq. mm.)	= 1 square centimetre (sq. cm.)
100 square centimetres	= 1 square decimetre (sq. dm.)
100 square decimetres	= 1 square metre (sq. m.)
10,000 square metres	= 1 hectare
1,000,000 square metres	= 1 square kilometre (sq. Km.)
<i>Conversion</i>	
1 sq. in.	= 6.45 sq. cm. approximately
1 sq. ft.	= 0.09 sq. m.                      "
1 sq. mi.	= 2.6 sq. Km.                      "
1 sq. cm.	= 0.15 sq. in.                      "
1 hectare	= 2.47 acres                      "
1 sq. kilometre	= 0.39 sq. mi.                      "

Important plane figures include a square, a rectangle, a triangle and a circle.

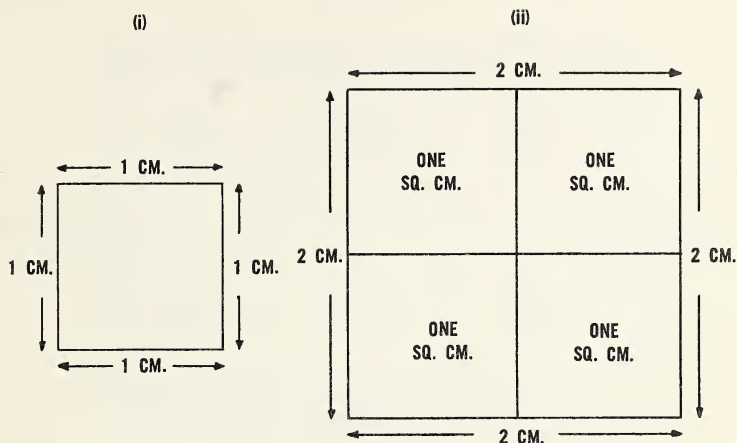
### A Square

A square, as shown in figure 13-7, is a four-sided figure where all the sides are of equal length and all the angles are right angles.

The perimeter of the square in (i) is  $1 + 1 + 1 + 1 = 4$  cm.  
in (ii) is  $2 + 2 + 2 + 2 = 8$  cm.

Figure 13-7

## A Square



The area in (i) is 1 sq. cm.

in (ii) is 4 sq. cm.

The area is calculated by multiplying one side by a second side; i.e., in (ii):

$$2 \times 2 \times 1 \text{ cm.} = 4 \text{ sq. cm., or}$$

$$\text{Area} = s \times s = s^2 \quad (1)$$

*Example:* Farmer MacDonald has a field 100 metres square.

- How many metres of fencing will he require to completely fence it in?
- What area will he have to plough if he ploughs the whole field?

---

(a) Perimeter  $= 4 \times 100 \times 1 \text{ m.} = 400 \text{ m.}$

$\therefore$  Fencing required  $= 400 \text{ m.}$

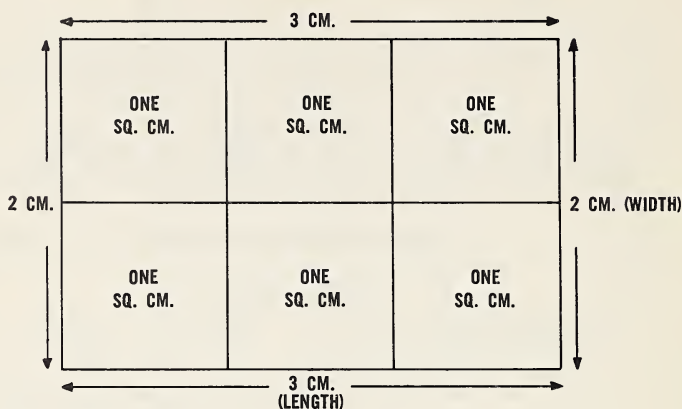
(b) Area  $= 100 \times 100 \times 1 \text{ m.} = 10,000 \text{ sq. m.}$

$\therefore$  Area ploughed  $= 1 \text{ hectare}$

## A Rectangle

A rectangle, as shown in figure 13-8, is a four-sided figure where the opposite sides are equal to each other and the angles are all right angles.

## A Rectangle


$$2 \times 3 \times 1 \text{ cm.} = 6 \text{ sq. cm., or}$$

$$Area = lw \quad (2)$$

(a) How long is it?

(b) What is the area of the field in hectares?

(a) Perimeter =  $2l + 2w = 752$  metres  
but  $w = 60$  metres

$$\therefore 2l + 2 \times 60 = 752$$

$$\therefore 2l = 752 - 120$$

$$\therefore 2l = 632$$

$$l = 316 \text{ metres}$$

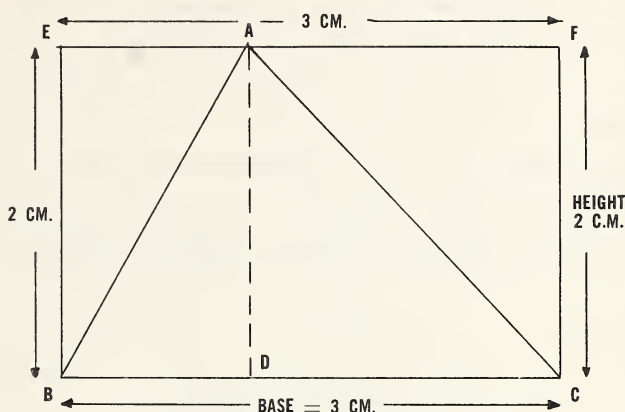
$$\begin{aligned} \text{(b) Area} &= l \times w \\ &= 316 \times 60 \times 1 \text{ sq. m.} \\ &= 18,960 \text{ sq. m.} \\ A &= 1.896 \text{ hectares} \end{aligned}$$

## A Triangle

A triangle, as shown in figure 13-9, is a plane figure enclosed by three sides.

Figure 13-9

A Triangle



For convenience we have lettered the points of intersection. ABC is a triangle. To find its area we look first at the rectangle EBD A and see that half of this rectangle is in the triangle. If we look at the rectangle AD CF, we see that half of this rectangle is in the triangle. Therefore, if we look at the big rectangle EBCF, we see that the triangle occupies half its total area.

As we know how to find the area of a rectangle, we can now find the area of a triangle as it will always be one half the area of a rectangle formed by the base times the height of the triangle. The equation is:

$$\text{Area} = \frac{1}{2} (b \times h) \quad (3)$$

The area of the triangle in figure 13-9 is therefore:

$$\text{Area} = \frac{1}{2} (3 \times 2) \times 1 \text{ sq. cm.} = 3 \text{ sq. cm.}$$

*Example:* Farmer MacDonald has a triangular field which he uses to grow corn. The base of the field is 120 metres, and the other two sides are both 75 metres long. The distance of the peak (the apex of the triangle) is 25 metres from the base.

(a) How many decimetres of fencing will he require to fence in the field?

(b) How many hectares of potatoes will he have to plant?

---

(a) Perimeter:  $120 + 75 + 75 = 270$  metres  
                   1 metre                   = 10 decimetres  
                   Length of fencing = 2700 decimetres

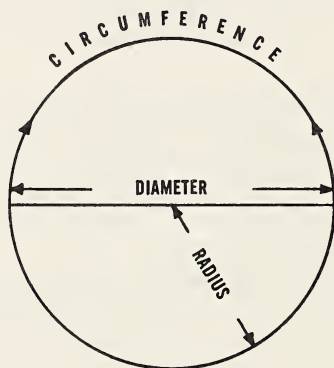
(b) Area: $\frac{1}{2} (b \times h)$	$= \frac{1}{2} (120 \times 25) = \frac{1}{2} (3,000)$
	$= 1500 \text{ square metres}$
10,000 square metres	$= 1 \text{ hectare}$
$\therefore 1500 \text{ square metres}$	$= 0.15 \text{ hectares}$

## A Circle

The perimeter of a circle is called the *circumference*. A straight line drawn through the centre of the circle to cut the circumference in two places is called the *diameter*. A straight line drawn from the centre to the circumference is called the *radius*. The diameter is equal to twice the radius, or  $d = 2r$ . Figure 13-10 shows a circle.

Figure 13-10

A Circle



The Greek letter pi, written  $\pi$ , represents the relationship between the circumference and the diameter of every circle. This is a constant.

$$\pi = \frac{\text{circumference}}{\text{diameter}} = \frac{22}{7} \text{ or } 3.1416$$

The circumference therefore can be found if the diameter or radius of the circle is known as:

$$\frac{c}{d} = \pi, \text{ or}$$

$$c = \pi d; \text{ and as } d = 2r \text{ (above),}$$

$$C = 2\pi r \quad (4)$$

The equation to find the area of a circle is:

$$A = \pi r^2 \quad (5)$$



*Example:* Sunny Nager is building a circular swimming pool in his garden. The diameter of the pool is to be 25 feet.

- How many square feet of tiling will be needed to tile the bottom of the pool? How many square metres?
- If there is a 2-foot walkway around the pool, how many feet and inches of fencing will be required to fence in the pool? How many metres?

---


$$\begin{aligned}
 \text{(a) Radius of pool} &= 12.5 \text{ ft.} \\
 \therefore \text{Area of bottom} &= 3.1416 \times 12.5 \times 12.5 \text{ sq. ft.} \\
 \therefore \text{Tiling required} &= 490.875 \text{ sq. ft.} \\
 1 \text{ sq. ft.} &= 0.09 \text{ sq. m.} \\
 \therefore 490.875 \text{ sq. ft.} &= 44.18 \text{ sq. m.} \\
 \text{(b) Radius of enclosure} &= 12.5 \text{ ft.} + 2 \text{ ft.} \\
 &= 14.5 \text{ ft.} \\
 \text{Circumference} &= 2\pi r = 2 \times 3.1416 \times 14.5 \\
 &= 91.1064 \text{ ft.} \\
 \therefore \text{Length of fence} &= 91 \text{ ft. } 1.3 \text{ in.} \\
 1 \text{ ft.} &= 0.3048 \text{ m.} \\
 \therefore 91.1064 \text{ ft.} &= 91.1064 \times 0.3048 \text{ m.} \\
 &= 27.80 \text{ m.}
 \end{aligned}$$

## WORKOUT EXERCISE V

1. Find the unknown properties in the following squares:

	<i>Side</i>	<i>Perimeter</i>	<i>Area</i>
(a)	9 cm.	—	—
(b)	—	124 mm.	—
(c)	—	—	225 sq. m.
(d)	8 yd. 2 ft.	—	—
(e)	—	10 yd. 2 ft.	—
(f)	—	—	1,681 sq. in.
(g)	18 dm.	—	—
(h)	—	16 Km.	—
(i)	—	—	16 hectares

2. Sam Kline decides to tile his recreation room which is 30 feet square. If the tiles are 15 centimetres square, assuming no loss, how many tiles will he require?

3. Find the unknown properties in the following rectangles:

	<i>Length</i>	<i>Width</i>	<i>Perimeter</i>	<i>Area</i>
(a)	2 in.	3 in.	—	—
(b)	18 m.	—	62 m.	—
(c)	—	3.2 yd.	—	16 sq. yd.
(d)	6.8 cm.	—	—	23.12 sq. cm.
(e)	—	2.7 ro.	21.2 ro.	—

4. Find the areas of the following triangles:

	<i>Base</i>	<i>Height</i>		<i>Base</i>	<i>Height</i>
(a)	3.7 cm.	3.9 cm.	(e)	4.8 m.	260.3 cm.
(b)	14.2 in.	8.4 in.	(f)	9 ft. 7 in.	3 ft. 8 in.
(c)	4 ft. 1 in.	3 ft. 2 in.	(g)	4 ft. 2 in.	5 ft. 8 in.
(d)	2 ft. 3 in.	3 ft. 6 in.	(h)	4.2 Km.	17,362 m.

5. Find the unknown properties in the following circles. Use  $\pi = \frac{22}{7}$ .

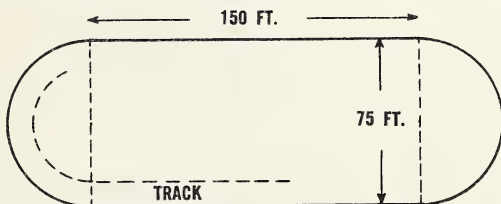
	<i>Radius</i>	<i>Diameter</i>	<i>Circumference</i>	<i>Area</i>
(a)	12 cm.	—	—	— sq. cm.
(b)	—	11 m.	—	— sq. cm.
(c)	—	—	42 mm.	— sq. cm.
(d)	0.75 cm.	—	—	— sq. cm.
(e)	—	5 yd. 2 ft. 2½ in.	—	— sq. ft.
(f)	—	—	160 rods	— sq. yd.

6. Carl Peters ploughed a 780-metre square to sow some oats. Around the outside of the ploughed field he left a 20-decimetres strip and then fenced in the whole area. If he placed fence posts at 14 metre intervals, how many posts would he need for the field? How many acres, correct to two decimal places, are contained in the fenced-in area?

7. The side of a baseball diamond is 90 feet. What is the area of the diamond in square metres? How many metres must a player run to score a home run?

8. You have the opportunity of purchasing either a rectangular lot 14 m.  $\times$  18 m. or a square having the same perimeter for \$2,500. Which is the better buy? How much per square metre would you pay in each case?

9. A triangular field has a perimeter of 48 m. and a base of 21 m. If the second side is twice the length of the third side, how long are the other two sides?
10. Find the cost of fencing a triangular field if fencing costs \$2.50 a metre and the base of the field is 27 metres and the other two equal sides are  $\frac{7}{9}$  as long.
11. If the perimeter of a triangle is 72 cm. and the sides are in a 4:3:2 ratio, what is the length of each side?
12. What is the area in square metres, to two decimal places, of the triangle contained within the triangle measuring 64 ro. by 18 ro.?
13. The circumference of the earth, measured around the equator, is 25,000 miles. What is the radius to the nearest kilometre?
14. The inside diameter of the cylindrical gasoline tanks used by Super Octane Incorporated to haul their gasoline is 1,850 centimetres. What is the area of the cross section in square metres? In square feet and square inches, to the nearest inch?
15. An indoor track is formed by a rectangle 150 ft. long by 75 ft. wide. At each end of the rectangle is a semi-circle as shown below. What is the total area of the floor space? What is the length of the guard fence around the track area? If the track is formed 6 ft. wide, what is the area of the track? If a boy ran once around, down the middle of the track, how many metres would he run?



16. The doorway leading into Gaulle Hall has an opening composed of a rectangle 2.36 m. wide and 3.1 m. high with a semi-circular arch on top. What is the area of the doorway? If a beading is placed up the sides and around the arch which costs \$5.50 a foot to instal, how much will the beading cost?
17. In Mary-Jane Pancake Inn you are offered two 15 cm. diameter pancakes or four 7.5 cm. diameter pancakes for 35¢. How much per square centimetre would you pay in each case? Which is the better bargain?
18. "God's Little Acre" would become "God's Little (what fraction) of a hectare".

## SECTION 5 Volume

Any article having length, width and height is a solid. Cubic measure is used to find the volume or the amount of space within the boundaries of three dimensional figures. In the case of a hollow solid, its inside dimensions measure its *capacity*. A table of metric weight and the approximate avoirdupois (or English) weight is given in figure 13-11.

Figure 13-11

<i>Metric</i>	
1,000,000,000 cubic millimetres (cu. mm.)	= 1 cubic metre (cu. m.)
1,000,000 cubic centimetres (cu. cm.)	= 1 cu. m.
1,000 cubic decimetres (cu. dm.)	= 1 cu. m.
100 centilitres	= 1 litre
10 decilitres	= 1 litre
100 litres	= 1 hectolitre (Hl.)
<i>Approximate Equivalents</i>	
1 cubic inch	= 16.387 cubic centimetres, approx.
1 cubic centimetre	= 0.061 cubic inches, approx.
1 cubic foot	= 6.25 gallons, approx.
1 cubic foot	= 28.32 cubic decimetres
1 cubic decimetre	= 0.04 cubic feet
1 cubic yard	= 0.76 cubic metres
1 cord	= 3.62 cubic metres
1 cubic metre	= 1.308 cubic yards
1 cubic metre	= 1,000 litres

### A Rectangular Solid

A rectangular solid is a body having six surfaces as shown in figure 13-12. It can be expressed in the number of cubic units contained in the solid. A *cube* is a particular type of rectangular solid having equal length, width and height.

The number of small cubes in (i) is 1 in the small cube and  $2 \times 2 \times 2 = 8$  in the large cube. In (ii) the number of small cubes is  $2 \times 3 \times 4 = 24$ . In each case to find the number of cubes in the figure, we have multiplied the length by the width by the height, or:

$$V = l \times w \times h \quad (6)$$

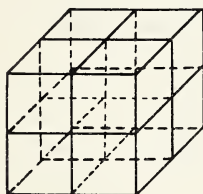
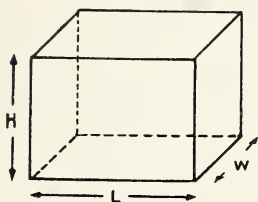
As the area of the base is  $l \times w$ , the volume can also be expressed as:

$$V = A \times h \quad (7)$$

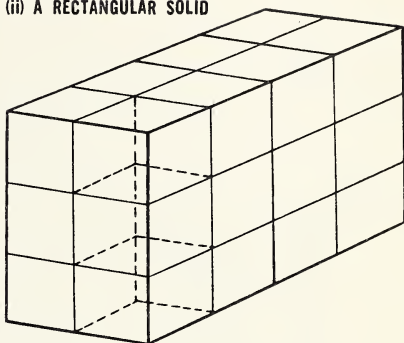
Figure 13-12

## Rectangular Solids

(i) A CUBE



(ii) A RECTANGULAR SOLID



*Example:* The Gizmo Manufacturing Company pack their product in cartons having a 36 cu. m. volume. If the cartons are 2 m. wide and 3 m. high:

- How long are they?
- How many square metres of floor space will be taken up to store 6 dozen cases piled three high?
- How many cubic yards of space will be used?

$$(a) V = l \times w \times h$$

Divide both sides by  $w$  and  $h$ .

$$\begin{aligned} \therefore l &= \frac{V}{w \times h} \\ &= \frac{36}{2 \times 3} = \frac{36}{6} \\ &= 6 \text{ m. long} \end{aligned}$$

$$\begin{aligned} (b) \text{ Floor space of one carton} &= l \times w \\ &= 6 \times 2 \\ &= 12 \text{ sq. m.} \end{aligned}$$

$$\begin{aligned} 6 \text{ dozen cases} &= 72 \text{ cases} \\ \text{If piled 3 high} &= 24 \text{ piles} \\ \text{Each pile occupies} &= 12 \text{ sq. m.} \\ \therefore \text{Area needed} &= 12 \times 24 \\ &= 288 \text{ sq. m.} \end{aligned}$$



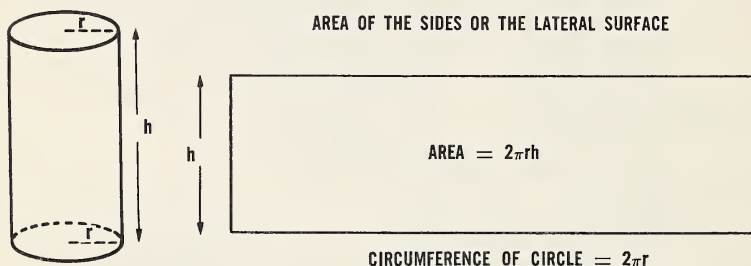
(c) Volume needed, in cubic metres:

$$\begin{aligned}
 &= 288 \times 9 \\
 &= 2592 \text{ cu. m.} \\
 1 \text{ cu. m.} &= 1.308 \text{ cu. yd.} \\
 \therefore 2592 \text{ cu. m.} &= 1.308 \times 2592 \\
 &= 3,390.34 \\
 &= 3,391 \text{ cu. yd. approx.}
 \end{aligned}$$

**Figure 13-13**

(i)

(ii) *Area of top and bottom is twice the area of the circle.*



The total area of the cylinder is:

$$A = 2\pi r^2 + 2\pi r h \quad (8)$$

The procedure to find the volume of the cylinder is the same as for the rectangular figure. Find the area of the base, and multiply it by the height. We know the area of the base is the area of the circle, or  $\pi r^2$ . Therefore:

$$V = \pi r^2 h \quad (9)$$

*Example:* La Glace Cr  merie collect cream, from farmers, in a refrigerated cylindrical truck to manufacture ice-cream. If the inside of the cylinder is 8 metres long with a diameter of 2 metres and each cubic metre holds 1,000 litres of cream:

- (a) How many litres of cream does the cylinder hold?
- (b) If the average pickup per farmer is 95 litres, how many farmers must be called on to fill the cylinder?

---


$$\begin{aligned}
 \text{(a) Volume} &= \pi \times r^2 \times h \\
 &= 3.1416 \times 1 \times 1 \times 8 \\
 &= 25.1328 \text{ cubic metres} \\
 &= 25.1328 \times 1,000 \text{ litres} \\
 &= 25,132.8 \text{ litres}
 \end{aligned}$$

(b) Average pickup = 95 litres

$$\begin{aligned}\text{Number of farmers called on} &= \frac{25,132.8}{95} \\ &= 265 \text{ farmers}\end{aligned}$$

## WORKOUT EXERCISE VI

Find the missing dimensions of the following rectangular solids:

	<i>Length</i>	<i>Width</i>	<i>Height</i>	<i>Volume</i>
1.	3.5 cm.	2.5 cm.	5.25 cm.	— cu. cm.
2.	7.1 cm.	8.0 cm.	—	244.24 cu. cm.
3.	—	15.2 m.	2106 cm.	8,511.5232 cu. m.
4.	11 Km.	— Km.	12 miles	1,189.59456 cu. Km.
5.	5 dm.	1.3 dm.	3.4 dm.	— cu. dm.
6.	6.2 cm.	3.1 in.	7.4 cm.	— cu. cm.
7.	2.95 m.	—	143 cm.	6 cu. m. 623,045 cu. cm.
8.	8 ft. 6 in.	1 ft. 3 in.	2 ft. 6 in.	— cu. ft. cu. in.
9.	30.48 m.	3 ft. 3 in.	—	1,056 cu. ft. 432 cu. in.
10.	7.62 cm.	3 in.	7.62 cm.	— cu. in.

Find the missing measurements of the following cylinders using the formula,  $\pi = \frac{22}{7}$ .

	<i>Radius</i>	<i>Diameter</i>	<i>Circumference</i>	<i>Length</i>	<i>Area</i>	<i>Volume</i>
11.	4 inches	—	—	10.16 cm.	— sq. cm.	— cu. cm.
12.	—	—	154 m.	5.5 m.	—	—
13.	—	2 Km.	—	3.25 Km.	—	—
14.	1 foot	—	—	2.4 m.	— sq. m.	— cu. m.
15.	—	—	49 m.	7 yd.	— sq. m.	— cu. m.

16. Walter Shax built a concrete boathouse with outside dimensions of 4 metres wide by 6 metres long by 3.5 metres high. The floor was 30 centimetres thick. The walls which were built up on the outer edges of the floor were 20 centimetres thick. The ceiling to the outside edges of the wall was 15 centimetres thick. If a hole 60 centimetres by 45 centimetres was left for a window and a hole 1.8 metres by 1.8 metres was left for the door, how many cubic metres of concrete were needed? If the concrete cost \$45 a cubic yard, how much did the boathouse cost?

17. Tot Rod Tricycle Manufacturers erect a water tank on their premises to supply water in case of fire. The tank is cylindrical in shape and is 7 metres high with a diameter of 3 metres. How many litres of water will it hold if it is filled to within  $\frac{1}{2}$  metre of the top? If a standard hose delivers 1,000 litres per minute and there are 3 hoses connected to the supply, how long will it take before the tank is half empty?

## SECTION 6 Figuring for Fun

1. A mathematical card trick: Take a 52-card deck and assume the Ace is number 1, the Jack is 11, the Queen 12, and the King 13. Shuffle the cards well and ask someone to form three piles in the following way:

- (a) Place one card face up on the table and use its numerical value as a starting point (say, 5 of hearts).
- (b) Continue counting up to 13 and place cards *face down* on top of (a) (e.g., 6, 7, 8, 9, 10, 11, 12, 13 or another 8 cards).
- (c) Turn the pile over.
- (d) Make two more piles in the same way as (a), (b) and (c).

Take and count the cards that are left over (say, 27). Ask someone to turn face up any *two* of the top cards and you will tell them what the third card is. (These are the three original cards in (a) above.)

*Method:* Add together the value of the two cards turned up, say Jack and deuce, and to this add 10 (e.g.,  $11 + 2 + 10 = 23$ ). Subtract this 23 from the number left, 27, and the card you want is 4.

2. Luke Adams had a piece of land which was 100 metres square. He decided to keep one-quarter for himself and to divide the remainder equally among his four sons in such a manner that each would receive a similarly shaped piece. How can this be accomplished? What would be the area of each piece of land?

3. When the digits of a certain number are reversed, they are equal to the square of one-half the number. What is the number?

4. Pretty Polly quotes her vital statistics as 33-24-33. If she had to quote them in centimetres, what would they be?

## APPENDIX A

### ROUNDING OFF

#### Whole Numbers

In many mathematical calculations it is more meaningful to give the answer in terms of a large unit. For instance, if the census-taker reports the population of a country as 21,321,971, this figure could be reported as 21,000,000, rounded off to the nearest million.

<i>Examples:</i> Round off 8,321 to the nearest hundred	= 8,300
Round off 72,916 to the nearest thousand	= 73,000
Round off 41,351 to the nearest hundred	= 41,400
Round off 445 to the nearest ten	= 440
Round off 4,349 to the nearest hundred	= 4,300
Round off 4,351 to the nearest hundred	= 4,400
Round off 3,750 to the nearest hundred	= 3,800
Round off 7,450 to the nearest hundred	= 7,400
Round off 7,451 to the nearest hundred	= 7,500

*Rule:* To round off a number to a specified place, replace all the digits to the right of that place by zeros.

*Rule:* To adjust the digit immediately to the left of the part dropped:

(a) If the part dropped begins with 1, 2, 3, or 4, the digit to the left remains unchanged.

(b) If the part dropped begins with 6, 7, 8, or 9, the digit to the left is increased by 1.

(c) If the part dropped begins with 5 and is followed only by zeros, the preceding digit is increased if it is an odd number but left unchanged if it is an even number. (This is the rule followed in this text, although some authorities always increase the retained digit.) See examples 7 and 8 above.

(d) If the part dropped begins with 5 and is followed by a digit other than zero, the preceding digit is increased by one. See last example above.

#### Decimal Fractions

The above method can be extended to include decimal fractions.

*Rule:* To round off a number to a specified place, drop all the digits to the right of that place.

*Rule:* To adjust the digit immediately to the left of the part dropped, proceed as above for whole numbers.

Examples:

Examples:

	Ten Thousands	Thousands	Hundreds	Tens		Units	Ten Thousands	Thousands	Hundreds	
(1)	3	1	7	6	to the nearest tenth	=	3	2		
(2)	6	0	3	5	2	to the nearest hundredth	=	6	0	4
(3)	4	5	9	7	to the nearest hundredth	=	4	6	<u>0</u>	
(4)	18	9	7		to the nearest tenth	=	19	<u>0</u>		
(5)	79	9	9		to the nearest tenth	=	80	<u>0</u>		
(6)	5	8	1	6	to the nearest unit	=	6			
(7)	616	3	4	9	to the nearest ten	=	620			

Note: The zeros must be included in the result:

In (3): The zeros in the tenths and hundredths places must be included; otherwise 4.6 would appear to be given to the nearest tenth instead of to the nearest hundredth as requested.

In (4): The zero in the tenths place must be retained; otherwise 19 would appear to be given to the nearest unit instead of to the nearest tenth as requested.

In (5): The zero for the unit digit must be retained as a place holder for the 8 tens, and the zero in the tenths place retained to indicate the answer is correct to the nearest tenth.

In (7): The zero must be retained in the units place as a place holder.

## APPENDIX B

### MULTIPLICATION AND DIVISION – SOME SHORT CUTS

#### Some Short Cuts in Multiplication

To multiply by:	Procedure	Answer
5	Add one zero	$\left. \begin{array}{l} 139 \times 5 = 1,390 \div 2 = 695 \\ 3,162 \times 50 = 316,200 \div 2 = 1,581 \\ 623 \times 500 = 623,000 \div 2 = 311,500 \end{array} \right\} \text{and divide by two}$
50	Add two zeros	
500	Add three zeros	
11	Separate the two digits and insert their sum between: $11 \times 31 = 3 \ (3+1) \ 1 =$ <p>If the sum of the two digits exceeds 9, carry 1 to the left hand digit:</p> $11 \times 37 = 3 \ (3+7) \ 7 = 3 \ (10) \ 7 =$ $11 \times 49 = 4 \ (4+9) \ 9 = 4 \ (13) \ 9 =$	341
		407
		539



To multiply by:	Procedure	Answer
	<p>If there are more than two digits, separate the end digits; then, starting with the two right hand digits, add two at a time from right to left:</p> $11 \times 312 = 3 (3+1) (1+2) 2 =$ $11 \times 371 = 3 (3+7) (7+1) 1 = 3 (10) (8) 1 =$ $11 \times 6,721 = 6 (6+7) (7+2) (2+1) 1 =$ $6 (13) (9) (3) 1 =$ $11 \times 103,762 = 1 (1+0) (0+3) (3+7) (7+6) (6+2) 2 =$ $1 (1) (3) (10) (13) (8) 2 =$	<p>3,432</p> <p>4,081</p> <p>73,931</p> <p>1,141,382</p>
12 to 19	<p>(a) Multiply the multiplicand by the <i>last</i> digit of the multiplier.</p> <p>(b) Write down the product one place to the <i>right</i> of the multiplicand and add:</p> $4,962 \times 13$ $\begin{array}{r} 4962 \\ 14886 \\ \hline 64506 \end{array}$	<p>64,506</p>
21, 31, 41, etc.	<p>(a) Multiply the multiplicand by the <i>first</i> digit of the multiplier.</p> <p>(b) Write down the product one place to the <i>left</i> of the multiplicand and add:</p> $4,962 \times 31$ $\begin{array}{r} 4962 \\ 14886 \\ \hline 153822 \end{array}$	<p>153,822</p>
	<p>Note: The last two methods, i.e., <math>\times 13</math> and <math>\times 31</math>, use similar methods. To remember the difference:</p> <p><math>\times 13</math> — the digit 3 is to the right; place the product to the right of the multiplicand,</p> <p><math>\times 31</math> — the digit 3 is to the left; place the product to the left of the multiplicand.</p>	
15	<p>(a) Add one zero to the number.</p> <p>(b) Divide by two and add:</p> $75 \times 15$ $\begin{array}{r} (a) \quad 750 \\ (b) \quad 375 \\ \hline 1125 \end{array}$	<p>1,125</p>
25	<p>(a) Add two zeros.</p> <p>(b) Divide by four for the answer:</p> $136 \times 25$ $\begin{array}{r} (a) \quad 13600 \\ (b) \quad 3400 \end{array}$	<p>3,400</p>
19, 29, 39, etc.	<p>(a) Multiply multiplicand by next highest figures, e.g., 30, and place product <i>above</i> multiplicand.</p> <p>(b) Subtract multiplicand from product obtained in (a):</p> $419 \times 29$ $\begin{array}{r} 12570 \\ 419 \\ \hline 12151 \end{array}$ $\begin{array}{r} (\times 30) \\ (\times 1) \\ \hline (\times 29) \end{array}$	<p>12,151</p>

To multiply by:	Procedure	Answer
21, 31, 41, etc.	(a) Multiply multiplicand by next lowest figures, e.g., 30, and place product above multiplicand. (b) Add: $  \begin{array}{r}  419 \times 31 \qquad 1\ 2\ 5\ 7\ 0 \qquad (\times 30) \\  \underline{\qquad 4\ 1\ 9 \qquad} \qquad (\times 1) \\  1\ 2\ 9\ 8\ 9 \qquad \underline{\qquad (\times 31)} \\  \hline  \end{array}  $	12,989
A number close to 100	(a) Add two zeros. (b) Multiply multiplicand by amount over or under one hundred. (c) If over a hundred, add: $  \begin{array}{r}  571 \times 103 \qquad (a) \ 5\ 7\ 1\ 0\ 0 \qquad (\times 100) \\  \qquad \qquad \qquad (b) \ \underline{1\ 7\ 1\ 3} \qquad \underline{(\times 3)} \\  \qquad \qquad \qquad \qquad \underline{5\ 8\ 8\ 1\ 3} \qquad \underline{(\times 103)} \\  \hline  \end{array}  $ (d) If under a hundred, subtract: $  \begin{array}{r}  571 \times 98 \qquad (a) \ 5\ 7\ 1\ 0\ 0 \qquad (\times 100) \\  \qquad \qquad \qquad (b) \ \underline{1\ 1\ 4\ 2} \qquad \underline{(\times 2)} \\  \qquad \qquad \qquad \qquad \underline{5\ 5\ 9\ 5\ 8} \qquad \underline{(\times 98)} \\  \hline  \end{array}  $	58,813  55,958
1½, 2½, 3½, etc.	Divide multiplicand by 2. Multiply multiplier by 2. $  \begin{array}{l}  8,472 \times 3\frac{1}{2} = 4,236 \times 7 = \\  7,428 \times 7\frac{1}{2} = 3,714 \times 15 =  \end{array}  $	29,652 55,710

### Some Short Cuts in Division

See Chapter 2, Figuring for Fun Section for Austrian division which is a very fast and efficient method of long division.

To divide by:	Procedure	Answer
	Move decimal point:	
5	1 place to the left	85.0
50	2 places to the left	156.8
500	3 places to the left	196.850
12½	2 places to the left } and multiply by 8	34.32
25	2 places to the left } and multiply by 4	3,372.84
The above method can be used with all aliquot parts of 10, 100, 1,000, etc.		
10	Move decimal point 1 place to the left, $78,943 \div 10 =$	7,894.3
100	Move decimal point 2 places to the left, $78,943 \div 100 =$	789.43
1,000	Move decimal point 3 places to the left, $78,943 \div 1,000 =$	78.943
The above method can be used with all multiples of 10.		

To divide by:	Procedure	Answer
$1\frac{1}{2}$ , $2\frac{1}{2}$ , $3\frac{1}{2}$ , etc.	Multiply divisor by 2. Multiply dividend by 2.  $47 \div 3\frac{1}{2} = 94 \div 7 =$  $79\frac{1}{2} \div 7\frac{1}{2} = 159 \div 15 =$	   $13\frac{3}{7}$  $10\frac{3}{5}$

## Tests For Divisibility

Can be divided by:	If:
2	the final digit is divisible by 2: Example: 494. The final digit 4 is divisible by 2; therefore 492 is divisible by 2.
3	the sum of the digits is divisible by 3: Example: 136,821. Sum of the digits = 21. 21 is divisible by 3; therefore 136,821 is divisible by 3.
4	the two final digits are zeros or are divisible by 4: Example: 3,197,264. Final two digits = 64. 64 is divisible by 4; therefore 3,197,264 is divisible by 4.
5	the final digit is 0 or 5.
6	the last digit is an even number, and the sum of the digits is divisible by 3: Example: 3,297,264. Last digit is even. The sum of the digits = 33. 33 is divisible by 3; therefore 3,297,264 is divisible by 6.
8	the three final digits are divisible by 8: Example: 42,936. 936 is divisible by 8; therefore 42,936 is divisible by 8.
9	the sum of its digits is divisible by 9: Example: 362,349. Sum of the digits = 27. 27 is divisible by 9; therefore 362,349 is divisible by 9.
10	the final digit is 0.
11	starting from the right of the number: the sum of the digits in the odd places subtracted from the sum of the digits in the even places is zero, or divisible by 11: Example: 3,826,031. Sum of the odd-placed digits: $1 + 0 + 2 + 3 = 6$ Sum of the even-placed digits: $3 + 6 + 8 = 17$ $17 - 6 = 11$ ; 11 is divisible by 11; therefore 3,826,031 is divisible by 11.
12	the last two digits are divisible by 4, and the sum of the digits is divisible by 3: Example: 782,354,616. The last two digits, 16, are divisible by 4. The sum of the digits = 42; 42 is divisible by 3; therefore 782,354,616 is divisible by 12.

# TABLES

Table 1. Amount of \$1 at Compound Interest

Periods	$\frac{1}{2}$ %	$\frac{3}{4}$ %	1 %	1 $\frac{1}{4}$ %	1 $\frac{1}{2}$ %	1 $\frac{3}{4}$ %
1	1.003 3333	1.005 0000	1.008 7500	1.010 0000	1.012 5000	1.015 0000
2	1.006 6778	1.010 0250	1.017 5766	1.020 1000	1.025 1562	1.030 2250
3	1.010 0334	1.015 0751	1.026 4804	1.030 3010	1.037 9707	1.045 6784
4	1.013 4001	1.020 1505	1.035 4621	1.040 6040	1.050 9453	1.061 3636
5	1.016 7781	1.025 2513	1.044 5224	1.051 0101	1.064 0822	1.077 2840
6	1.020 1674	1.030 3775	1.053 6619	1.061 5202	1.077 3832	1.093 4433
7	1.023 5680	1.035 5294	1.062 8815	1.072 1354	1.090 8505	1.109 8449
8	1.026 9799	1.040 7070	1.072 1817	1.082 8567	1.104 4861	1.126 4926
9	1.030 4031	1.045 9106	1.081 5633	1.093 6853	1.118 2922	1.143 3900
10	1.033 8378	1.051 1401	1.091 0269	1.104 6221	1.132 2708	1.160 5408
11	1.037 2839	1.056 3958	1.100 5734	1.115 6683	1.146 4242	1.177 9489
12	1.040 7415	1.061 6778	1.110 2035	1.126 8250	1.160 7545	1.195 6182
13	1.044 2107	1.066 9862	1.119 9177	1.138 0933	1.175 2639	1.213 5524
14	1.047 6914	1.072 3211	1.129 7170	1.149 4742	1.189 9547	1.231 7557
15	1.051 1837	1.077 6827	1.139 6020	1.160 9690	1.204 8292	1.250 2321
16	1.054 6876	1.083 0712	1.149 5736	1.172 5786	1.219 8895	1.268 9855
17	1.058 2033	1.088 4865	1.159 6323	1.184 3044	1.235 1382	1.288 0203
18	1.061 7306	1.093 9289	1.169 7791	1.196 1475	1.250 5774	1.307 3406
19	1.065 2697	1.099 3986	1.180 0147	1.208 1090	1.266 2096	1.326 9507
20	1.068 8206	1.104 8956	1.190 3398	1.220 1900	1.282 0372	1.346 8550
21	1.072 3833	1.110 4201	1.200 7553	1.232 3919	1.298 0627	1.367 0578
22	1.075 9580	1.115 9722	1.211 2619	1.244 7159	1.314 2885	1.387 5637
23	1.079 5445	1.121 5520	1.221 8604	1.257 1630	1.330 7171	1.408 3772
24	1.083 1430	1.127 1598	1.232 5517	1.269 7346	1.347 3511	1.429 5028
25	1.086 7534	1.132 7956	1.243 3365	1.282 4320	1.364 1929	1.450 9454
26	1.090 3759	1.138 4596	1.254 2157	1.295 2563	1.381 2454	1.472 7095
27	1.094 0105	1.144 1519	1.265 1901	1.308 2089	1.398 5109	1.494 8002
28	1.097 6572	1.149 8726	1.276 2605	1.321 2910	1.415 9823	1.517 2222
29	1.101 3161	1.155 6220	1.287 4278	1.334 5039	1.433 6922	1.539 9805
30	1.104 9871	1.161 4001	1.298 6928	1.347 8489	1.451 6134	1.563 0802
31	1.108 6704	1.167 2071	1.310 0564	1.361 3274	1.469 7585	1.586 5264
32	1.112 3660	1.173 0431	1.321 5194	1.374 9407	1.488 1305	1.610 3243
33	1.116 0739	1.178 9083	1.333 0826	1.388 6901	1.506 7321	1.634 4792
34	1.119 7941	1.184 8029	1.344 7471	1.402 5770	1.525 5663	1.658 9964
35	1.123 5268	1.190 7269	1.356 5137	1.416 6028	1.544 6359	1.683 8813
36	1.127 2719	1.196 6805	1.368 3832	1.430 7688	1.563 9438	1.709 1395
37	1.131 0294	1.202 6639	1.380 3565	1.445 0765	1.583 4931	1.734 7766
38	1.134 7995	1.208 6772	1.392 4346	1.459 5272	1.603 2868	1.760 7983
39	1.138 5822	1.214 7206	1.404 6184	1.474 1225	1.623 3279	1.787 2103
40	1.142 3775	1.220 7942	1.416 9088	1.488 8637	1.643 6195	1.814 0184
41	1.146 1854	1.226 8982	1.429 3068	1.503 7524	1.664 1647	1.841 2287
42	1.150 0060	1.233 0327	1.441 8132	1.518 7899	1.684 9668	1.868 8471
43	1.153 8394	1.239 1979	1.454 4291	1.533 9778	1.706 0289	1.896 8798
44	1.157 6855	1.245 3938	1.467 1553	1.549 3176	1.727 3542	1.925 3330
45	1.161 5445	1.251 6208	1.479 9930	1.564 8107	1.748 9461	1.954 2130
46	1.165 4163	1.257 8789	1.492 9429	1.580 4589	1.770 8080	1.983 5262
47	1.169 3010	1.264 1683	1.506 0061	1.596 2634	1.792 9431	2.013 2791
48	1.173 1987	1.270 4892	1.519 1837	1.612 2261	1.815 3549	2.043 4783
49	1.177 1093	1.276 8416	1.532 4766	1.628 3483	1.838 0468	2.074 1305
50	1.181 0330	1.283 2258	1.545 8857	1.644 6318	1.861 0224	2.105 2424
60	1.220 9966	1.348 8502	1.686 6030	1.816 6967	2.107 1813	2.443 2198
70	1.262 3124	1.417 8305	1.840 1293	2.006 7634	2.385 9000	2.835 4563
80	1.305 0263	1.490 3386	2.007 6307	2.216 7152	2.701 4849	3.290 6628
90	1.349 1855	1.566 5547	2.190 3791	2.448 6327	3.058 8126	3.818 9485
100	1.394 8390	1.646 6685	2.389 7627	2.704 8138	3.463 4043	4.432 0456
						5.668 1559

Table 1 (cont'd). Amount of \$1 at Compound Interest

Periods	2 %	2½ %	5 %	5½ %	6 %	7 %	8 %
1	1.020 0000	1.025 0000	1.050 0000	1.055 0000	1.060 0000	1.070 0000	1.080 0000
2	1.040 4000	1.050 6250	1.102 5000	1.113 0250	1.123 6000	1.144 9000	1.166 4000
3	1.061 2080	1.076 8906	1.157 6250	1.174 2414	1.191 0160	1.225 0430	1.259 7120
4	1.082 4322	1.103 8129	1.215 5062	1.238 8247	1.262 4770	1.310 7960	1.360 4890
5	1.104 0808	1.134 4082	1.276 2816	1.306 9600	1.338 2256	1.402 5517	1.469 3281
6	1.126 1624	1.159 6934	1.340 0956	1.378 8428	1.418 5191	1.500 7304	1.586 8743
7	1.148 6857	1.188 6858	1.407 1004	1.454 6792	1.503 6303	1.605 7815	1.713 8243
8	1.171 6594	1.218 4029	1.477 4554	1.534 6865	1.593 8481	1.718 1862	1.850 9302
9	1.195 0926	1.248 8630	1.551 3282	1.619 0943	1.689 4790	1.838 4592	1.999 0046
10	1.218 9944	1.280 0845	1.628 8946	1.708 1445	1.790 8477	1.967 1514	2.158 9250
11	1.243 3743	1.312 0867	1.710 3394	1.802 0924	1.898 2986	2.104 8520	2.331 6390
12	1.268 2418	1.344 8888	1.795 8563	1.901 2075	2.012 1965	2.252 1916	2.518 1701
13	1.293 6066	1.378 5110	1.885 6491	2.005 7739	2.132 9283	2.409 8450	2.719 6237
14	1.319 4778	1.412 9738	1.979 9316	2.116 0915	2.260 9040	2.578 5342	2.937 1936
15	1.345 8683	1.448 2982	2.078 9282	2.232 4765	2.396 5582	2.759 0315	3.172 1691
16	1.372 7857	1.484 5056	2.182 8746	2.355 2627	2.540 3517	2.952 1638	3.425 9426
17	1.400 2414	1.521 6183	2.292 0183	2.484 8021	2.692 7728	3.158 8152	3.700 0180
18	1.428 2462	1.559 6587	2.406 6192	2.621 4663	2.854 3392	3.379 9323	3.996 0195
19	1.456 8112	1.598 6502	2.526 9502	2.765 6469	3.025 5995	3.616 5275	4.315 7011
20	1.485 9474	1.638 6164	2.653 2977	2.917 7575	3.207 1355	3.869 6845	4.660 9571
21	1.515 6663	1.679 5818	2.785 9626	3.078 2342	3.399 5636	4.140 5624	5.033 8337
22	1.545 9797	1.721 5714	2.925 2607	3.247 5370	3.603 5374	4.430 4017	5.436 5404
23	1.576 8993	1.764 6107	3.071 5238	3.426 1516	3.819 7497	4.740 5299	5.871 4636
24	1.608 4372	1.808 7260	3.225 0999	3.614 5899	4.048 9346	5.072 3670	6.341 1807
25	1.640 6060	1.853 9441	3.386 3549	3.813 3923	4.291 8707	5.427 4326	6.848 4752
26	1.673 4181	1.900 2927	3.555 6727	4.023 1289	4.549 3830	5.807 3529	7.396 3532
27	1.706 8865	1.947 8000	3.733 4563	4.244 4010	4.822 3459	6.213 8676	7.988 0615
28	1.741 0242	1.996 4950	3.920 1291	4.477 8431	5.111 6867	6.648 8384	8.627 1064
29	1.775 8447	2.046 4074	4.116 1356	4.724 1244	5.418 3879	7.114 2570	9.317 2749
30	1.811 3616	2.097 5676	4.321 9424	4.983 9513	5.743 4912	7.612 2550	10.062 6569
31	1.847 5888	2.150 0068	4.538 0395	5.258 0686	6.088 1006	8.145 1129	10.867 6694
32	1.884 5406	2.203 7569	4.764 9415	5.547 2624	6.453 3867	8.715 2708	11.737 0830
33	1.922 2314	2.258 8509	5.003 1885	5.852 3618	6.840 5899	9.325 3398	12.676 0496
34	1.960 6760	2.315 3221	5.253 3480	6.174 2417	7.251 0253	9.978 1135	13.690 1336
35	1.999 8896	2.373 2052	5.516 0154	6.513 8250	7.686 0868	10.676 5815	14.785 3443
36	2.039 8873	2.432 5353	5.791 8161	6.872 0854	8.147 2520	11.423 9422	15.968 1718
37	2.080 6851	2.493 3487	6.081 4069	7.250 0501	8.636 0871	12.223 6181	17.245 6256
38	2.122 2988	2.555 6824	6.385 4773	7.648 8028	9.154 2524	13.079 2714	18.625 2756
39	2.164 7448	2.619 5745	6.704 7512	8.069 4870	9.703 5075	13.994 8204	20.115 2977
40	2.208 0397	2.685 8538	7.039 9887	8.513 3088	10.285 7179	14.974 4578	21.724 5215
41	2.252 2005	2.752 1904	7.391 9882	8.981 5408	10.902 8610	16.022 6699	23.462 4832
42	2.297 2445	2.820 9952	7.761 5876	9.475 5255	11.557 0327	17.144 2568	25.339 4819
43	2.343 1894	2.891 5201	8.149 6696	9.996 6794	12.250 4546	18.344 3548	27.366 6404
44	2.390 0531	2.963 8081	8.557 1503	10.546 4968	12.985 4819	19.628 4596	29.555 9717
45	2.437 8542	3.037 9033	8.985 0078	11.126 5541	13.764 6108	21.002 4518	31.920 4494
46	2.486 6113	3.113 8509	9.434 2582	11.738 5146	14.590 4875	22.472 6234	34.474 0853
47	2.536 3435	3.191 6971	9.905 9711	12.384 1329	15.465 9167	24.045 7070	37.232 0122
48	2.587 0704	3.271 4896	10.401 2696	13.065 2602	16.393 8717	25.728 9065	40.210 5731
49	2.638 8118	3.353 2768	10.921 3331	13.783 8495	17.377 5040	27.529 9300	43.427 4190
50	2.691 5880	3.437 1087	11.467 3998	14.541 9612	18.420 1543	29.457 0251	46.901 6125
60	3.281 0308	4.399 7898	18.079 1859	24.839 7704	32.987 6908	57.946 4268	101.257 0637
70	3.999 5582	5.632 1029	30.426 4255	42.429 9162	59.075 9302	113.989 3922	218.606 4059
80	4.875 4392	7.209 5678	49.561 4411	72.476 4203	105.795 9935	224.234 3876	471.954 8343
90	5.943 1331	9.228 8563	80.730 3650	123.800 2059	189.464 5112	441.102 9799	1018.915 0893
100	7.244 6461	11.813 7164	131.501 2578	211.468 6357	339.302 0835	867.716 3256	2199.761 2563



Table 2. Present Value of \$1

Periods	$\frac{1}{2}$ %	$\frac{1}{2}$ %	$\frac{1}{2}$ %	1 %	$1\frac{1}{4}$ %	$1\frac{1}{2}$ %	$1\frac{3}{4}$ %
1	0.996 6777	0.995 0249	0.991 3259	0.990 0990	0.987 6543	0.985 2217	0.982 8010
2	0.993 3665	0.990 0745	0.982 7270	0.980 2960	0.975 4611	0.970 6617	0.965 8978
3	0.990 0663	0.985 1488	0.974 2028	0.970 5901	0.963 4183	0.956 3170	0.949 2853
4	0.986 7770	0.980 2475	0.965 7524	0.960 9803	0.951 5243	0.942 1842	0.932 9585
5	0.983 4987	0.975 3707	0.957 3754	0.951 4657	0.939 7771	0.928 2603	0.916 9125
6	0.980 2313	0.970 5181	0.949 0710	0.942 0452	0.928 1749	0.914 5422	0.901 1425
7	0.976 9747	0.965 6896	0.940 8387	0.932 7181	0.916 7159	0.901 0268	0.885 6438
8	0.973 7289	0.960 8852	0.932 6778	0.923 4832	0.905 3984	0.887 7111	0.870 4116
9	0.970 4939	0.956 1047	0.924 5876	0.914 3398	0.894 2207	0.874 5922	0.855 4413
10	0.967 2697	0.951 3479	0.916 5676	0.905 2870	0.883 1809	0.861 6672	0.840 7286
11	0.964 0562	0.946 6149	0.908 6172	0.896 3237	0.872 2775	0.848 9332	0.826 2689
12	0.960 8534	0.941 9053	0.900 7358	0.887 4492	0.861 5086	0.836 3874	0.812 0579
13	0.957 6611	0.937 2192	0.892 9227	0.878 6626	0.850 8727	0.824 0270	0.798 0913
14	0.954 4795	0.932 5565	0.885 1774	0.869 9630	0.840 3681	0.811 8493	0.784 3649
15	0.951 3085	0.927 9169	0.877 4993	0.861 3495	0.829 9932	0.799 8515	0.770 8746
16	0.948 1480	0.923 3004	0.869 8878	0.852 8213	0.819 7463	0.788 0310	0.757 6163
17	0.944 9980	0.918 7068	0.862 3423	0.844 3775	0.809 6260	0.776 3853	0.744 5861
18	0.941 8585	0.914 1362	0.854 8623	0.836 0173	0.799 6306	0.764 9116	0.731 7799
19	0.938 7294	0.909 5882	0.847 4471	0.827 7399	0.789 7587	0.753 6075	0.719 1940
20	0.935 6107	0.905 0629	0.840 0962	0.819 5445	0.780 0085	0.742 4704	0.706 8246
21	0.932 5024	0.900 5601	0.832 8092	0.811 4302	0.770 3788	0.731 4979	0.694 6679
22	0.929 4043	0.896 0797	0.825 5853	0.803 3962	0.760 8680	0.720 6876	0.682 7203
23	0.926 3166	0.891 6216	0.818 4241	0.795 4418	0.751 4745	0.710 0371	0.670 9782
24	0.923 2392	0.887 1857	0.811 3250	0.787 5661	0.742 1971	0.699 5439	0.659 4380
25	0.920 1719	0.882 7718	0.804 2875	0.779 7684	0.733 0341	0.689 2058	0.648 0963
26	0.917 1149	0.878 3799	0.797 3110	0.772 0480	0.723 9843	0.679 0205	0.636 9497
27	0.914 0680	0.874 0099	0.790 3950	0.764 4039	0.715 0463	0.668 9857	0.625 9948
28	0.911 0312	0.869 6616	0.783 5391	0.756 8356	0.706 2185	0.659 0992	0.615 2283
29	0.908 0045	0.865 3349	0.776 7426	0.749 3421	0.697 4998	0.649 3589	0.604 6470
30	0.904 9879	0.861 0297	0.770 0050	0.741 9229	0.688 8887	0.639 7624	0.594 2476
31	0.901 9813	0.856 7460	0.763 3259	0.734 5771	0.680 3839	0.630 3078	0.584 0272
32	0.898 9847	0.852 4836	0.756 7048	0.727 3041	0.671 9841	0.620 9929	0.573 9825
33	0.895 9980	0.848 2424	0.750 1410	0.720 1031	0.663 6880	0.611 8157	0.564 1105
34	0.893 0213	0.844 0223	0.743 6342	0.712 9733	0.655 4943	0.602 7741	0.554 4084
35	0.890 0544	0.839 8231	0.737 1839	0.705 9142	0.647 4018	0.593 8661	0.544 8731
36	0.887 0974	0.835 6449	0.730 7895	0.698 9249	0.639 4092	0.585 0897	0.535 5018
37	0.884 1503	0.831 4875	0.724 4505	0.692 0049	0.631 5152	0.576 4431	0.526 2917
38	0.881 2129	0.827 3507	0.718 1666	0.685 1534	0.623 7187	0.567 9242	0.517 2400
39	0.878 2853	0.823 2346	0.711 9371	0.678 3697	0.616 0185	0.559 5313	0.508 3440
40	0.875 3674	0.819 1389	0.705 7617	0.671 6531	0.608 4133	0.551 2623	0.499 6010
41	0.872 4592	0.815 0635	0.699 6399	0.665 0031	0.600 9021	0.543 1156	0.491 0083
42	0.869 5607	0.811 0085	0.693 5711	0.658 4189	0.593 4835	0.535 0892	0.482 5635
43	0.866 6718	0.806 9736	0.687 5550	0.651 8999	0.585 1566	0.527 1815	0.474 2639
44	0.863 7924	0.802 9588	0.681 5911	0.645 4455	0.578 9201	0.519 3907	0.466 1070
45	0.860 9227	0.798 9640	0.675 6789	0.639 0549	0.571 7729	0.511 7149	0.458 0904
46	0.858 0625	0.794 9891	0.669 8180	0.632 7276	0.564 7140	0.504 1527	0.450 2117
47	0.855 2118	0.791 0339	0.664 0079	0.626 4630	0.557 7422	0.496 7021	0.442 4685
48	0.852 3706	0.787 0984	0.658 2482	0.620 2604	0.550 8565	0.489 3617	0.434 8585
49	0.849 5388	0.783 1825	0.652 5385	0.614 1192	0.544 0558	0.482 1297	0.427 3793
50	0.846 7164	0.779 2868	0.646 8783	0.608 0388	0.537 3391	0.475 0047	0.420 0288
60	0.819 0031	0.741 3722	0.592 9078	0.550 4496	0.474 5676	0.409 2960	0.353 1303
70	0.792 1969	0.705 3029	0.543 4401	0.498 3149	0.419 1291	0.352 6769	0.296 8867
80	0.766 2681	0.670 9885	0.498 0996	0.451 1179	0.370 1668	0.303 8901	0.249 6011
90	0.741 1879	0.638 3435	0.456 5420	0.408 3912	0.326 9242	0.261 8522	0.209 8468
100	0.716 9286	0.607 2868	0.418 4516	0.369 7112	0.288 7333	0.225 6294	0.176 4242

Table 2 (cont'd). Present Value of \$1

Periods	2 %	2½ %	5 %	5½ %	6 %	7 %	8 %
1	0.980 3922	0.975 6098	0.952 3810	0.947 8673	0.943 3962	0.934 5794	0.925 9259
2	0.961 1688	0.951 8144	0.907 0295	0.898 4524	0.889 9964	0.873 4387	0.857 3388
3	0.942 3223	0.928 5994	0.863 8376	0.851 6137	0.839 6193	0.816 2979	0.793 8322
4	0.923 8454	0.905 9506	0.822 7025	0.807 2167	0.792 0937	0.762 8952	0.735 0298
5	0.905 7308	0.883 8543	0.783 5262	0.765 1344	0.747 2582	0.712 9862	0.680 5832
6	0.887 9714	0.862 2969	0.746 2154	0.725 2458	0.704 9605	0.666 3422	0.630 1696
7	0.870 5602	0.841 2652	0.710 6813	0.687 4368	0.665 0571	0.622 7497	0.583 4904
8	0.853 4904	0.820 7466	0.676 8394	0.651 5989	0.627 4124	0.582 0091	0.540 2689
9	0.836 7553	0.800 7284	0.644 6089	0.617 6293	0.591 8985	0.543 9337	0.500 2490
10	0.820 3483	0.781 1984	0.613 9132	0.585 4306	0.558 3948	0.508 3493	0.463 1935
11	0.804 2630	0.762 1448	0.584 6793	0.554 9105	0.526 7875	0.475 0928	0.428 8829
12	0.788 4932	0.743 5559	0.556 8374	0.525 9815	0.496 9694	0.444 0120	0.397 1138
13	0.773 0325	0.725 4204	0.530 3214	0.498 5607	0.468 8390	0.414 9644	0.367 6979
14	0.757 8750	0.707 7272	0.505 0680	0.472 5694	0.442 3010	0.387 8172	0.340 4610
15	0.743 0147	0.690 4656	0.481 0171	0.447 9331	0.417 2651	0.362 4460	0.315 2417
16	0.728 4458	0.673 6249	0.458 1115	0.424 5811	0.393 6463	0.338 7346	0.291 8905
17	0.714 1626	0.657 1951	0.436 2967	0.402 4465	0.371 3644	0.316 5744	0.270 2690
18	0.700 1594	0.641 1659	0.415 5206	0.381 4659	0.350 3438	0.295 8639	0.250 2490
19	0.686 4308	0.625 5277	0.395 7340	0.361 5791	0.330 5130	0.276 5083	0.231 7121
20	0.672 9713	0.610 2709	0.376 8895	0.342 7290	0.311 8047	0.258 4190	0.214 5482
21	0.659 7758	0.595 3863	0.358 9424	0.324 8616	0.294 1554	0.241 5131	0.198 6558
22	0.646 8390	0.580 8647	0.341 8499	0.307 9257	0.277 5051	0.225 7132	0.183 9405
23	0.634 1559	0.566 6972	0.325 5713	0.291 8727	0.261 7973	0.210 9469	0.170 3153
24	0.621 7215	0.552 8754	0.310 0679	0.276 6566	0.246 9786	0.197 1466	0.157 6993
25	0.609 5309	0.539 3906	0.295 3028	0.262 2337	0.232 9986	0.184 2492	0.146 0179
26	0.597 5793	0.526 2347	0.281 2407	0.248 5627	0.219 8100	0.172 1955	0.135 2018
27	0.585 8620	0.513 3997	0.267 8483	0.235 6045	0.207 3680	0.160 9304	0.125 1868
28	0.574 3746	0.500 8778	0.255 0938	0.223 3218	0.195 6301	0.150 4022	0.115 9137
29	0.563 1123	0.488 6612	0.242 9463	0.211 6794	0.184 5567	0.140 5628	0.107 3275
30	0.552 0709	0.476 7427	0.231 3774	0.200 6440	0.174 1101	0.131 3671	0.099 3773
31	0.541 2460	0.465 1148	0.220 3595	0.190 1839	0.164 2548	0.122 7730	0.092 0160
32	0.530 6333	0.453 7706	0.209 8662	0.180 2691	0.154 9574	0.114 7411	0.085 2000
33	0.520 2287	0.442 7030	0.199 8725	0.170 8712	0.146 1862	0.107 2347	0.078 8889
34	0.510 0282	0.431 9053	0.190 3548	0.161 9632	0.137 9115	0.100 2193	0.073 0453
35	0.500 0276	0.421 3711	0.181 2903	0.153 5196	0.130 1052	0.093 6629	0.067 6345
36	0.490 2232	0.411 0937	0.172 6574	0.145 5162	0.122 7408	0.087 5355	0.062 6246
37	0.480 6109	0.401 0670	0.164 4356	0.137 9301	0.115 7932	0.081 8088	0.057 9857
38	0.471 1872	0.391 2849	0.156 6054	0.130 7394	0.109 2388	0.076 4509	0.053 6905
39	0.461 9482	0.381 7414	0.149 1480	0.123 9236	0.103 0555	0.071 4550	0.049 7134
40	0.452 8904	0.372 4306	0.142 0457	0.117 4631	0.097 2222	0.066 7804	0.046 0309
41	0.444 0102	0.363 3470	0.135 2816	0.111 3395	0.091 7190	0.062 4116	0.042 6212
42	0.435 3041	0.354 4848	0.128 8396	0.105 5350	0.086 5274	0.058 3286	0.039 4641
43	0.426 7688	0.345 8389	0.122 7044	0.100 0332	0.081 6296	0.054 5127	0.036 5408
44	0.418 4007	0.337 4038	0.116 8613	0.094 8182	0.077 0091	0.050 9464	0.033 8341
45	0.410 1968	0.329 1744	0.111 2965	0.089 8751	0.072 6501	0.047 6135	0.031 3279
46	0.402 1537	0.321 1458	0.105 9967	0.085 1897	0.068 5378	0.044 4986	0.029 0073
47	0.394 2684	0.313 3129	0.100 9492	0.080 7485	0.064 6583	0.041 5875	0.026 8586
48	0.386 5376	0.305 6712	0.096 1421	0.076 5389	0.060 9984	0.038 8668	0.024 8691
49	0.378 9584	0.298 2158	0.091 5639	0.072 5487	0.057 5457	0.036 3241	0.023 0269
50	0.371 5279	0.290 9422	0.087 2037	0.068 7665	0.054 2884	0.033 9478	0.021 3212
60	0.304 7823	0.227 2836	0.053 5355	0.040 2580	0.030 3143	0.017 2573	0.009 8758
70	0.250 0276	0.177 5536	0.032 8662	0.023 5683	0.016 9274	0.008 7728	0.004 5744
80	0.205 1097	0.138 7046	0.020 1770	0.013 7976	0.009 4522	0.004 4596	0.002 1188
90	0.168 2614	0.108 3558	0.012 3869	0.008 0775	0.005 2780	0.002 2670	0.000 9814
100	0.138 0330	0.084 6474	0.007 6045	0.004 7288	0.002 9472	0.001 1524	0.000 4546

**Table 3. Sample Amortization Form**

*For a \$7,000 loan at 6½% interest; principal and interest repaid over 15 years; 180 monthly payments of \$60.65.*

Payment Number	Payment Of		Balance Of Loan	Payment Number	Payment Of		Balance Of Loan
	Interest	Loan			Interest	Loan	
1	37.41	23.24	6,976.76	46	31.11	29.54	5,791.88
2	37.29	23.36	6,953.40	47	30.96	29.69	5,762.19
3	37.16	23.49	6,929.91	48	30.80	29.85	5,732.34
4	37.04	23.61	6,906.30	49	30.64	30.01	5,702.33
5	36.91	23.74	6,882.56	50	30.48	30.17	5,672.16
6	36.79	23.86	6,858.70	51	30.32	30.33	5,641.83
7	36.66	23.99	6,834.71	52	30.15	30.50	5,611.33
8	36.53	24.12	6,810.59	53	29.99	30.66	5,580.67
9	36.40	24.25	6,786.34	54	29.83	30.82	5,549.85
10	36.27	24.38	6,761.96	55	29.66	30.99	5,518.86
11	36.14	24.51	6,737.45	56	29.50	31.15	5,487.71
12	36.01	24.64	6,712.81	57	29.33	31.32	5,456.39
13	35.88	24.77	6,688.04	58	29.16	31.49	5,424.90
14	35.75	24.90	6,663.14	59	28.99	31.66	5,393.24
15	35.61	25.04	6,638.10	60	28.83	31.82	5,361.42
16	35.48	25.17	6,612.93	61	28.66	31.99	5,329.43
17	35.34	25.31	6,587.62	62	28.48	32.17	5,297.26
18	35.21	25.44	6,562.18	63	28.31	32.34	5,264.92
19	35.07	25.58	6,536.60	64	28.14	32.51	5,232.41
20	34.94	25.71	6,510.89	65	27.97	32.68	5,199.73
21	34.80	25.85	6,485.04	66	27.79	32.86	5,166.87
22	34.66	25.99	6,459.05	67	27.62	33.03	5,133.84
23	34.52	26.13	6,432.92	68	27.44	33.21	5,100.63
24	34.38	26.27	6,406.65	69	27.26	33.39	5,067.24
25	34.24	26.41	6,380.24	70	27.08	33.57	5,033.67
26	34.10	26.55	6,353.69	71	26.90	33.75	4,999.92
27	33.96	26.69	6,327.00	72	26.72	33.93	4,965.99
28	33.82	26.83	6,300.17	73	26.54	34.11	4,931.88
29	33.67	26.98	6,273.19	74	26.36	34.29	4,897.59
30	33.53	27.12	6,246.07	75	26.18	34.47	4,863.12
31	33.38	27.27	6,218.80	76	25.99	34.66	4,828.46
32	33.24	27.41	6,191.39	77	25.81	34.84	4,793.62
33	33.09	27.56	6,163.83	78	25.62	35.03	4,758.59
34	32.94	27.71	6,136.12	79	25.43	35.22	4,723.37
35	32.80	27.85	6,108.27	80	25.25	35.40	4,687.97
36	32.65	28.00	6,080.27	81	25.06	35.59	4,652.38
37	32.50	28.15	6,052.12	82	24.87	35.78	4,616.60
38	32.35	28.30	6,023.82	83	24.67	35.98	4,580.62
39	32.20	28.45	5,995.37	84	24.48	36.17	4,544.45
40	32.04	28.61	5,966.76	85	24.29	36.36	4,508.09
41	31.89	28.76	5,938.00	86	24.09	36.56	4,471.53
42	31.74	28.91	5,909.09	87	23.90	36.75	4,434.78
43	31.58	29.07	5,880.02	88	23.70	36.95	4,397.83
44	31.43	29.22	5,850.80	89	23.51	37.14	4,360.69
45	31.27	29.38	5,821.42	90	23.31	37.34	4,323.35

**Table 3 (cont'd). Sample Amortization Form**

*For a \$7,000 loan at 6½% interest; principal and interest repaid over 15 years; 180 monthly payments of \$60.65.*

Payment Number	Payment Of		Balance Of Loan	Payment Number	Payment Of		Balance Of Loan
	Interest	Loan			Interest	Loan	
91	23.11	37.54	4,285.81	136	12.93	47.72	2,371.46
92	22.91	37.74	4,248.07	137	12.67	47.98	2,323.48
93	22.70	37.95	4,210.12	138	12.42	48.23	2,275.25
94	22.50	38.15	4,171.97	139	12.16	48.49	2,226.76
95	22.30	38.35	4,133.62	140	11.90	48.75	2,178.01
96	22.09	38.56	4,095.06	141	11.64	49.01	2,129.00
97	21.89	38.76	4,056.30	142	11.38	49.27	2,079.73
98	21.68	38.97	4,017.33	143	11.12	49.53	2,030.20
99	21.47	39.18	3,978.15	144	10.85	49.80	1,980.40
100	21.26	39.39	3,938.76	145	10.58	50.07	1,930.33
101	21.05	39.60	3,899.16	146	10.32	50.33	1,880.00
102	20.84	39.81	3,859.35	147	10.05	50.60	1,829.40
103	20.63	40.02	3,819.33	148	9.78	50.87	1,778.53
104	20.41	40.24	3,779.09	149	9.51	51.14	1,727.39
105	20.20	40.45	3,738.64	150	9.23	51.42	1,675.97
106	19.98	40.67	3,697.97	151	8.96	51.69	1,624.28
107	19.76	40.89	3,657.08	152	8.68	51.97	1,572.31
108	19.55	41.10	3,615.98	153	8.40	52.25	1,520.06
109	19.33	41.32	3,574.66	154	8.12	52.53	1,467.53
110	19.11	41.54	3,533.12	155	7.84	52.81	1,414.72
111	18.88	41.77	3,491.35	156	7.56	53.09	1,361.63
112	18.66	41.99	3,449.36	157	7.28	53.37	1,308.26
113	18.44	42.21	3,407.15	158	6.99	53.66	1,254.60
114	18.21	42.44	3,364.71	159	6.71	53.94	1,200.66
115	17.98	42.67	3,322.04	160	6.42	54.23	1,146.43
116	17.76	42.89	3,279.15	161	6.13	54.52	1,091.91
117	17.53	43.12	3,236.03	162	5.84	54.81	1,037.10
118	17.30	43.35	3,192.68	163	5.54	55.11	981.99
119	17.06	43.59	3,149.09	164	5.25	55.40	926.59
120	16.83	43.82	3,105.27	165	4.95	55.70	870.89
121	16.60	44.05	3,061.22	166	4.65	56.00	814.89
122	16.36	44.29	3,016.93	167	4.36	56.29	758.60
123	16.12	44.53	2,972.40	168	4.05	56.60	702.00
124	15.89	44.76	2,927.64	169	3.75	56.90	645.10
125	15.65	45.00	2,882.64	170	3.45	57.20	587.90
126	15.41	45.24	2,837.40	171	3.14	57.51	530.39
127	15.17	45.48	2,791.92	172	2.83	57.82	472.57
128	14.92	45.73	2,746.19	173	2.53	58.12	414.45
129	14.68	45.97	2,700.22	174	2.22	58.43	356.02
130	14.43	46.22	2,654.00	175	1.90	58.75	297.27
131	14.18	46.47	2,607.53	176	1.59	59.06	238.21
132	13.94	46.71	2,560.82	177	1.27	59.38	178.83
133	13.69	46.96	2,513.86	178	.96	59.69	119.14
134	13.44	47.21	2,466.65	179	.64	60.01	59.13
135	13.18	47.47	2,419.18	180	.32	59.13	59.45*

\* The final payment is usually somewhat different from the regular payment, and is shown starred on the last line.

Table 4. Monthly Payment to Amortize a Loan at 7%

Term Amount	18 Years	19 Years	20 Years	21 Years	22 Years	23 Years	24 Years	25 Years
\$100	.81	.79	.77	.76	.74	.73	.72	.71
200	1.62	1.58	1.54	1.51	1.48	1.45	1.43	1.41
300	2.43	2.37	2.31	2.26	2.22	2.18	2.14	2.11
400	3.24	3.16	3.08	3.01	2.95	2.90	2.85	2.81
500	4.05	3.95	3.85	3.77	3.69	3.62	3.56	3.51
600	4.86	4.73	4.62	4.52	4.43	4.35	4.27	4.21
700	5.67	5.52	5.39	5.27	5.17	5.07	4.99	4.91
800	6.48	6.31	6.16	6.02	5.90	5.79	5.70	5.61
900	7.29	7.10	6.93	6.78	6.64	6.52	6.41	6.31
1000	8.10	7.89	7.70	7.53	7.38	7.24	7.12	7.01
1100	8.91	8.68	8.47	8.28	8.12	7.97	7.83	7.71
1200	9.72	9.46	9.24	9.03	8.85	8.69	8.54	8.41
1300	10.53	10.25	10.01	9.79	9.59	9.41	9.25	9.11
1400	11.34	11.04	10.78	10.54	10.33	10.14	9.97	9.81
1500	12.15	11.83	11.54	11.29	11.06	10.86	10.68	10.51
1600	12.96	12.62	12.31	12.04	11.80	11.58	11.39	11.21
1700	13.77	13.41	13.08	12.80	12.54	12.31	12.10	11.91
1800	14.58	14.19	13.85	13.55	13.28	13.03	12.81	12.61
1900	15.39	14.98	14.62	14.30	14.01	13.76	13.52	13.31
2000	16.20	15.77	15.39	15.05	14.75	14.48	14.23	14.01
2100	17.01	16.56	16.16	15.81	15.49	15.20	14.95	14.71
2200	17.82	17.35	16.93	16.56	16.23	15.93	15.66	15.41
2300	18.63	18.14	17.70	17.31	16.96	16.65	16.37	16.11
2400	19.44	18.92	18.47	18.06	17.70	17.37	17.08	16.81
2500	20.25	19.71	19.24	18.82	18.44	18.10	17.79	17.52
2600	21.06	20.50	20.01	19.57	19.17	18.82	18.50	18.22
2700	21.87	21.29	20.78	20.32	19.91	19.54	19.21	18.92
2800	22.68	22.08	21.55	21.07	20.65	20.27	19.93	19.62
2900	23.49	22.87	22.31	21.82	21.39	20.99	20.64	20.32
3000	24.30	23.65	23.08	22.58	22.12	21.72	21.35	21.02
3100	25.10	24.44	23.85	23.33	22.86	22.44	22.06	21.72
3200	25.91	25.23	24.62	24.08	23.60	23.16	22.77	22.42
3300	26.72	26.02	25.39	24.83	24.34	23.89	23.48	23.12
3400	27.53	26.81	26.16	25.59	25.07	24.61	24.19	23.82
3500	28.34	27.59	26.93	26.34	25.81	25.33	24.91	24.52
3600	29.15	28.38	27.70	27.09	26.55	26.06	25.62	25.22
3700	29.96	29.17	28.47	27.84	27.28	26.78	26.33	25.92
3800	30.77	29.96	29.24	28.60	28.02	27.51	27.04	26.62
3900	31.58	30.75	30.01	29.35	28.76	28.23	27.75	27.32
4000	32.39	31.54	30.78	30.10	29.50	28.95	28.46	28.02
4100	33.20	32.32	31.55	30.85	30.23	29.68	29.18	28.72
4200	34.01	33.11	32.32	31.61	30.97	30.40	29.89	29.42
4300	34.82	33.90	33.09	32.36	31.71	31.12	30.60	30.12
4400	35.63	34.69	33.85	33.11	32.45	31.85	31.31	30.82
4500	36.44	35.48	34.62	33.86	33.18	32.57	32.02	31.52
4600	37.25	36.27	35.39	34.62	33.92	33.30	32.73	32.22
4700	38.06	37.05	36.16	35.37	34.66	34.02	33.44	32.92
4800	38.87	37.84	36.93	36.12	35.39	34.74	34.16	33.62
4900	39.68	38.63	37.70	36.87	36.13	35.47	34.87	34.33
5000	40.49	39.42	38.47	37.63	36.87	36.19	35.58	35.03
5100	41.30	40.21	39.24	38.38	37.61	36.91	36.29	35.73
5200	42.11	41.00	40.01	39.13	38.34	37.64	37.00	36.43
5300	42.92	41.78	40.78	39.88	39.08	38.36	37.71	37.13
5400	43.73	42.57	41.55	40.63	39.82	39.08	38.42	37.83
5500	44.54	43.36	42.32	41.39	40.56	39.81	39.14	38.53



Table 4 (cont'd). Monthly Payment to Amortize a Loan at 7%

Term Amount	18 Years	19 Years	20 Years	21 Years	22 Years	23 Years	24 Years	25 Years
5500	45.35	44.15	43.09	42.14	41.29	40.53	39.85	39.23
5700	46.16	44.94	43.86	42.89	42.03	41.26	40.56	39.93
5800	46.97	45.73	44.62	43.64	42.77	41.98	41.27	40.63
5900	47.78	46.51	45.39	44.40	43.50	42.70	41.98	41.33
6000	48.59	47.30	46.16	45.15	44.24	43.45	42.69	42.03
6100	49.40	48.09	46.93	45.90	44.98	44.15	43.40	42.73
6200	50.20	48.88	47.70	46.65	45.72	44.87	44.12	43.43
6300	51.01	49.67	48.47	47.41	46.45	45.60	44.83	44.13
6400	51.82	50.46	49.24	48.16	47.19	46.32	45.54	44.83
6500	52.63	51.24	50.01	48.91	47.93	47.05	46.25	45.53
6600	53.44	52.03	50.78	49.66	48.67	47.77	46.96	46.23
6700	54.25	52.82	51.55	50.42	49.40	48.49	47.67	46.93
6800	55.06	53.61	52.32	51.17	50.14	49.22	48.38	47.63
6900	55.87	54.40	53.09	51.92	50.88	49.94	49.10	48.33
7000	56.68	55.18	53.86	52.67	51.61	50.66	49.81	49.03
7100	57.49	55.97	54.63	53.43	52.35	51.39	50.52	49.73
7200	58.30	56.76	55.40	54.18	53.09	52.11	51.23	50.43
7300	59.11	57.55	56.16	54.93	53.83	52.84	51.94	51.14
7400	59.92	58.34	56.93	55.68	54.56	53.56	52.65	51.84
7500	60.73	59.13	57.70	56.44	55.30	54.28	53.37	52.54
7600	61.54	59.91	58.47	57.19	56.04	55.01	54.08	53.24
7700	62.35	60.70	59.24	57.94	56.78	55.73	54.79	53.94
7800	63.16	61.49	60.01	58.69	57.51	56.45	55.50	54.64
7900	63.97	62.28	60.78	59.44	58.25	57.18	56.21	55.34
8000	64.78	63.07	61.55	60.20	58.99	57.90	56.92	56.04
8100	65.59	63.86	62.32	60.95	59.72	58.62	57.63	56.74
8200	66.40	64.64	63.09	61.70	60.46	59.35	58.35	57.44
8300	67.21	65.43	63.86	62.45	61.20	60.07	59.06	58.14
8400	68.02	66.22	64.63	63.21	61.94	60.80	59.77	58.84
8500	68.83	67.01	65.40	63.96	62.67	61.52	60.48	59.54
8600	69.64	67.80	66.17	64.71	63.41	62.24	61.19	60.24
8700	70.45	68.59	66.93	65.46	64.15	62.97	61.90	60.94
8800	71.26	69.37	67.70	66.22	64.89	63.69	62.61	61.64
8900	72.07	70.16	68.47	66.97	65.62	64.41	63.33	62.34
9000	72.88	70.95	69.24	67.72	66.36	65.14	64.04	63.04
9100	73.69	71.74	70.01	68.47	67.10	65.86	64.75	63.74
9200	74.49	72.53	70.78	69.23	67.83	66.59	65.46	64.44
9300	75.30	73.32	71.55	69.98	68.57	67.31	66.17	65.14
9400	76.11	74.10	72.32	70.73	69.31	68.03	66.88	65.84
9500	76.92	74.89	73.09	71.48	70.05	68.76	67.59	66.54
9600	77.73	75.68	73.86	72.24	70.78	69.48	68.31	67.24
9700	78.54	76.47	74.63	72.99	71.52	70.20	69.02	67.95
9800	79.35	77.26	75.40	73.74	72.26	70.93	69.73	68.65
9900	80.16	78.04	76.17	74.49	73.00	71.65	70.44	69.35
10000	80.97	78.83	76.94	75.25	73.73	72.38	71.15	70.05
11000	89.07	86.72	84.63	82.77	81.11	79.61	78.27	77.05
12000	97.17	94.60	92.32	90.29	88.48	86.85	85.38	84.05
13000	105.26	102.48	100.02	97.82	95.85	94.09	92.50	91.06
14000	113.36	110.36	107.71	105.34	103.22	101.32	99.61	98.06
15000	121.46	118.25	115.40	112.87	110.60	108.56	106.73	105.07
16000	129.55	126.13	123.09	120.39	117.97	115.80	113.84	112.07
17000	137.65	134.01	130.79	127.91	125.34	123.03	120.95	119.08
18000	145.75	141.90	138.48	135.44	132.72	130.27	128.07	126.06
19000	153.84	149.78	146.17	142.96	140.09	137.51	135.18	133.08
20000	161.94	157.66	153.87	150.49	147.46	144.75	142.30	140.09

Table 5. American Experience Table of Mortality

1 Age	2 Number Living	3 Number Dying	4 Yearly Probability of Dying	5 Yearly Probability of Living	1 Age	2 Number Living	3 Number Dying	4 Yearly Probability of Dying	5 Yearly Probability of Living
10	100 000	749	0.007 490	0.992 510	53	66 797	1 091	0.016 333	0.983 667
11	99 251	746	0.007 516	0.992 484	54	65 706	1 143	0.017 396	0.982 604
12	98 505	743	0.007 543	0.992 457	55	64 563	1 199	0.018 571	0.981 429
13	97 762	740	0.007 569	0.992 421	56	63 364	1 260	0.019 885	0.980 115
14	97 022	737	0.007 596	0.992 404	57	62 104	1 325	0.021 335	0.978 665
15	96 285	735	0.007 634	0.992 366	58	60 779	1 394	0.022 936	0.977 064
16	95 550	732	0.007 661	0.992 339	59	59 385	1 468	0.024 720	0.975 280
17	94 818	729	0.007 688	0.992 312	60	57 917	1 546	0.026 693	0.973 307
18	94 089	727	0.007 727	0.992 273	61	56 371	1 628	0.028 880	0.971 120
19	93 362	725	0.007 765	0.992 235	62	54 743	1 713	0.031 292	0.968 708
20	92 637	723	0.007 805	0.992 195	63	53 030	1 800	0.033 943	0.966 057
21	91 914	722	0.007 855	0.992 145	64	51 230	1 889	0.036 873	0.963 127
22	91 192	721	0.007 906	0.992 094	65	49 341	1 980	0.040 129	0.959 871
23	90 471	720	0.007 958	0.992 042	66	47 361	2 070	0.043 707	0.956 293
24	89 751	719	0.008 011	0.991 989	67	45 291	2 158	0.047 647	0.952 353
25	89 032	718	0.008 065	0.991 935	68	43 133	2 243	0.052 002	0.947 998
26	88 314	718	0.008 130	0.991 870	69	40 890	2 321	0.056 762	0.943 238
27	87 596	718	0.008 197	0.991 803	70	38 569	2 391	0.061 993	0.938 007
28	86 878	718	0.008 264	0.991 736	71	36 178	2 448	0.067 665	0.932 335
29	86 160	719	0.008 345	0.991 655	72	33 730	2 487	0.073 733	0.926 267
30	85 441	720	0.008 427	0.991 573	73	31 243	2 505	0.080 178	0.919 282
31	84 721	721	0.008 510	0.991 490	74	28 738	2 501	0.087 028	0.912 972
32	84 000	723	0.008 607	0.991 393	75	26 237	2 476	0.094 371	0.905 629
33	83 277	726	0.008 718	0.991 282	76	23 761	2 431	0.102 311	0.897 689
34	82 551	729	0.008 831	0.991 169	77	21 330	2 369	0.111 064	0.888 936
35	81 822	732	0.008 946	0.991 054	78	18 961	2 291	0.120 827	0.879 173
36	81 090	737	0.009 089	0.990 911	79	16 670	2 196	0.131 734	0.868 266
37	80 353	742	0.009 234	0.990 766	80	14 474	2 091	0.144 466	0.855 534
38	79 611	749	0.009 408	0.990 592	81	12 383	1 964	0.158 605	0.841 395
39	78 862	756	0.009 586	0.990 414	82	10 419	1 816	0.174 297	0.825 703
40	78 106	765	0.009 794	0.990 206	83	8 603	1 648	0.191 561	0.808 439
41	77 341	774	0.010 008	0.989 992	84	6 955	1 470	0.211 359	0.788 641
42	76 567	785	0.010 252	0.989 748	85	5 485	1 292	0.235 552	0.764 448
43	75 782	797	0.010 517	0.989 483	86	4 193	1 114	0.265 681	0.734 319
44	74 985	812	0.010 829	0.989 171	87	3 079	933	0.303 020	0.696 980
45	74 173	828	0.011 163	0.988 837	88	2 146	744	0.346 692	0.653 308
46	73 345	848	0.011 562	0.988 438	89	1 402	555	0.395 863	0.604 137
47	72 497	870	0.012 000	0.988 000	90	847	385	0.454 545	0.545 455
48	71 627	896	0.012 509	0.987 491	91	462	246	0.532 466	0.467 534
49	70 731	927	0.013 106	0.986 894	92	216	137	0.634 259	0.365 741
50	69 804	962	0.013 781	0.986 219	93	79	58	0.734 177	0.265 823
51	68 842	1 001	0.014 541	0.985 459	94	21	18	0.857 143	0.142 857
52	67 841	1 044	0.015 389	0.984 611	95	3	3	1.000 000	0.000 000

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NOV 2 '68			
NOV 1 2 RETURN			
NOV 10 '68			
NOV 20 '68			
DEC 2 '69			
RENEWAL			
FEB 24 '70			
RENEWAL			
MAR 3 '70			
MAR 10 '70			
MAR 9 '70			
MAR 17 '70			
APR - 2 RETURN			


RENEWAL  
FEB 24 70  
RENEWAL  
MAR 3 70

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